19.03.06 (5 of 8)

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
FY/96 DETAILED PROJECT DESCRIPTION

PROJECT TITLE: Supplemental Monitoring for the Proposed Spawning Channel Construction Project, Port Dick Creek, Lower Cook Inlet.

Project Number: ~~96239~~ 96139D

Restoration Category: Physical parameter monitoring for instream habitat & wild stock supplementation.

Proposer: Coble Geotechnical Services.

Lead Trustee Agency: Alaska Department of Fish and Game
Cooperating Agency: None

Duration: 5 years, FY/96 through FY/01

Cost FY 96: $9,200

Cost FY 97: $16,500

Cost FY 98: $16,500

Cost FY 99: $16,500

Cost FY 00: $16,500

Cost FY 01: $16,500

Cost FY 02:

Geographic Area: West Arm Port Dick, Southern Kenai Peninsula, Lower Cook Inlet.

Injured Resource/Service: The wild pink and chum salmon stocks of Port Dick Creek are the injured resource. The primary service provided is long term monitoring of physical hydrologic parameters, specifically water level, temperature, velocity and salinity. The Alaska Department of Fish and Game (ADFG) and Coble Geotechnical Services (CGS) will correlate this data to salmon-specific field measurements collected by ADFG.

ABSTRACT:

The proposed Port Dick Pink and Chum Salmon Spawning Channel would restore the wild pink and chum salmon stocks to pre-spill levels. The spawning channel would

increase the spawning habitat available in the Port Dick spill affected area. In order to evaluate the success of the proposed project it is important to obtain the basic hydrologic data that affect the anadromous fish habitat. Water temperature, water level, salinity and stream velocity are well correlated in the literature with egg survival, spawning success, egg fertilization and suitable spawning substrate of chum salmon, respectively. Initially these parameters would be monitored frequently initially (every 30 minutes) during the 3 months budgeted for FY/96. Based on these data, the monitoring interval will be adjusted based on the significance of the data. The data is continually collected and downloaded for analysis every 2 months for the 5 year duration of the project. The sensors will be inspected and calibrated also on a bimonthly basis.

INTRODUCTION:

The portion of Lower Cook Inlet (LCI) along the southern Kenai Peninsula has significant numbers of estuarine and intertidal nursery areas important to pink and chum salmon production. The harvest of pink and chum salmon returning to the area provide a significant contribution to the economy of the southern Kenai Peninsula. The original oil spill restoration surveys involved the identification of *Exxon Valdez Oil Spill* (EVOS) impacted areas and the determination of the optimal methods of salmon restoration. The focus of this proposal is to assist in habitat rehabilitation and enhancement methods.

The restoration surveys were initiated in FY/91 and FY/92, resulting in the final selection of Port Dick Creek, on the Outer Gulf Coastal area of the Kenai Peninsula (Figure 1). This system was chosen because it is considered one of the most important pink and chum salmon production streams in the LCI area and it was moderately to heavily oiled by the EVOS. Potential spawning channel feasibility analysis at this site was initiated in 1991 and continued through the spring of 1993. Dr. Robert B. Spies, Chief Scientist for the EVOS Trustee Council, reviewed the Port Dick project and developed several recommendations. This proposal assists ADFG in addressing these concerns.

Monitoring and analyses of hydrologic data have been demonstrated to correlate to egg-fry survival rates in all salmon species. Complete recovery from the EVOS may not occur for decades, and to fully differentiate the effect of the oil spill injuries on the ecosystem it is necessary to perform basic hydrologic measurements and analyses.

Also important in this salmon rehabilitation project is the need to evaluate and adjust the spawning channel to optimal salmon fry rearing habitat. For example, the optimum temperature for chum salmon survival was found to be 8 degrees centigrade (Pauley et al., 1988).

This proposal reduces the cost of long term water level monitoring currently being used onsite, while providing exceptional data quality, important additional parameters and improved data frequency. The benefits of obtaining basic hydrologic data can range from moderately helpful to extremely important. CGS is experienced in long term remote

hydrologic datalogging applications, data reduction and interpretation. CGS has agreed to make the analyses responsibilities with ADFG a joint effort.

NEED FOR THE PROJECT:

A. Statement of Problem

The targeted resource is the wild pink and chum salmon stocks of Port Dick Creek, in the West Arm of Port Dick Bay. Restoring the spawning channel will accelerate the recovery of the currently depressed wild pink and chum salmon stocks of Port Dick Creek.

Success of the proposed spawning channel construction project depends on a wide variety of physical parameters. Without adequate monitoring of temperature, water level and in some cases salinity it would be difficult to compare fry survival rates to possible residual EVOS effects during the monitoring period, for example. The proposed spawning channel will also need to be evaluated quantitatively based on long term hydrologic monitoring to determine the quality of salmon-rearing habitat.

B. Rationale

The ADFG proposal justifies the rationale using a benefit-cost comparison between the economic benefits of increased salmon production and the costs of the spawning channel project. It is important to evaluate the success of the proposed spawning channel in light of the physical parameters that have significant effects on salmon habitat

The chum and pink salmon life history are similar. The female chum salmon migrate upstream to spawn in the summer and fall. They create a gravel cavity and deposit their eggs. The eggs reside in the gravel substrate until fry emergence in the spring.

Several investigators have shown that most mortality that occurs between egg fertilization and the early fry stage occurs while eggs are incubating. Temperature, for example, has a profound effect on egg survival as well as alevin growth as shown in Figure 3. Other factors that have been correlated with mortality at this stage include erosion of streambeds caused by flooding, drought causing a lack of streamflow (which can result in a lack of dissolved oxygen or desiccation) and siltation.

Due to the fact that salmon fry emergence occurs in the spring a salmon run occurs in the summer, it is apparent that the salmon life cycle essentially requires year-round hydrologic monitoring to properly evaluate the spawning channel project. Long term data need not include water velocity between late November and February (at least a partially frozen channel at these times of year). Other adjustments in the collection of these data, such as specific locations of the sensors and sampling intervals are inevitable.

An additional rationale for this proposal is that it reduces some of the ADFG long term travel costs by using larger capacity dataloggers, and providing calibration, maintenance and cooperative analyses at competitive rates.

C. Summary of Major Hypothesis and Objectives

The objective is to provide quantitative data to compare to ADFG salmon life cycle measurements and to provide general information about the habitat created by the spawning channel construction project. Chum and wild pink salmon egg-to-fry survival rates will be measured by ADFG using eyed egg enclosures and fry Fyke nets. The hypothesis is that the ADFG data will have a direct correlation to temperature, salinity, water velocity and water depth parameters. These data are imperative for the evaluation of this project.

D. Completion Date

Completion of installation of monitoring equipment in early July, 1996. Completion of the spawning channel is scheduled for the spring of 1997. Follow up fry survival monitoring and concurrent physical parameter monitoring completed in 2001.

COMMUNITY INVOLVEMENT:

The community involvement for this project includes the Cook Inlet Seiners Association and the Cook Inlet Aquaculture Association as listed in the ADFG Port Dick proposal. In addition, CGS is a local geophysics firm seeking to be involved in the project.

FY 96 BUDGET:

Personnel	3.4
Travel	1.7
Contractual	4.1
Commodities	0.0
Equipment	0.0
Subtotal	9.2
Gen. Administration	
Total	9.2

PROJECT DESIGN:

A. Objectives

The major goal of this project involves the monitoring of hydrologic parameters after the construction of the spawning channel in July 1996. The following objectives and completion dates are proposed:

1. Installation of datalogging and sensor equipment in the arrangement shown in Figure 2 (temperature, water level, water velocity and conductivity sensors) in July, 1996.

2. Data will be collected every 2 months for the life of the project (although remote data collection would reduce travel costs, the sensors must be maintained and calibrated on a bimonthly basis to prevent data gaps and maintain data quality).

3. Correlation of physical parameters to salmon life cycle parameters as discussed ~~previously~~ in Section B., Methods (below).

B. Methods

Following construction of the spawning channel in July, 1996, 4 types of sensors are proposed for installation: temperature, water level, water velocity and conductivity. Figure 2 shows the general measurement locations and field arrangement of the equipment.

Water level measurements are currently being conducted using standpipes in the streams and a battery operated stream stage recorder. Results from these measurements will be used to finalize the size, depth and actual configuration of the spawning channel.

The changing channel geometry after construction and sensitivity of salmon eggs to water level necessitates monitoring of water levels after the spawning channel is constructed, however. This data will be collected using pressure transducers accurate to 0.01 ft of water within the pressure range expected at the site. The water levels will be measured at two locations as shown in Figure 2. Water level monitoring is proposed in the lower reaches of the spawning channel site, which is influenced by tidal fluctuations more than the upper reaches where a second monitoring location is proposed. The transducers measure pressure relative to atmospheric pressure so that atmospheric pressure effects need not be taken into account. The standpipes will be situated in the stream bed to a depth of no more than 3 feet, and if there is a noticeable difference in water level due to groundwater pressure differences an alternate method of securing the transducers to the substrate will be devised.

Temperature will be measured to an accuracy > 0.4 C. Temperature effects on salmon cited in the literature (e.g. Pauley, 1988; Wangaard, 1983) correlate fry survival rates to temperature using similar accuracy. When comparing results of the present study to previous studies it is useful to have similar accuracy.

Proposed temperature monitoring locations are shown in Figure 2. There are expected to be some temperature differences between the lower, deeper reaches of the spawning channel and the upper reaches, particularly in summer and fall months. The variation of temperature with depth in the spawning channel is not thought to be significant due to the turbulence of the water. The temperature probes will be secured within the top 10 cm of

substrate to facilitate comparisons of temperature to egg-fry survival rates and to protect the sensors. An additional temperature monitoring point in Port Dick Creek is proposed to provide a comparison to the known chum and wild pink salmon runs in that reach as shown in Figure 2. This data will be useful in evaluating the proposed spawning channel.

Figure 3 shows alevin growth varying considerably with temperature, in this case cumulative temperature (e.g. 10 days at 5 degrees centigrade = 50 Temperature Units). Figure 3 shows that temperatures must be measured over the long term to obtain useful data for correlation, either to previous years or to the literature. The winter period of 0 degrees centigrade between mid-Nov. and February would probably be among the least important regimes for the temperature data set, while spring through fall produce significant temperature differences.

Water velocity measurements are needed because low and high stream velocities can both adversely affect chum salmon. Spawning adult chum salmon use water with velocities varying between 46 and 101 cm/sec (Pauley, 1988). Streamflow therefore regulates the amount of spawning area available: increased flow covers more gravel, thus making more suitable spawning substrate available. Higher stream velocities erode the substrate and suitable spawning is decreased. It is especially critical when constructing a spawning channel to monitor the stream velocities.

In addition, salmon eggs require velocities of running water that keep the water well-oxygenated, protect the substrate from freezing temperatures, and remove waste metabolites (CO_2). Siltation is a major cause of egg and alevin mortality as mentioned previously, which is directly correlated to stream velocity. The current meter used is a USGS Type AA (Price-type) meter, which has an accurate window of measurement between 0.03 to 5.5 meters per second.

Salinity can interfere with fertilization of the eggs of chum salmon spawning in or near the intertidal zone (Figure 2). After absorption of the yolk sac, however, chum salmon can tolerate full-strength sea water. Salinity will be correlated to conductivity which is the parameter proposed for measurement. Sea water has a conductivity of approximately 40 to 50 msiemens, which requires an electrode spacing much greater than conductivity sensors for fresh water. The conductivity meter used will be calibrated from fresh water to full strength sea water, however the electrode spacing will be designed for discerning salinity changes in the spawning channel. The conductivity sensors will be attached to the temperature sensors in the substrate.

The datalogging equipment can easily retain measurements every 30 minutes for 2 months, without power constraints for the proposed sensors. Successive approximations of the original data set will be made and correlated to the original data set to determine what the sampling interval could be within the accuracy for each measured quantity. This analysis saves some time in using the data throughout the project by reducing the sampling rate. There is no additional cost to have a sampling rate of less than every 30 minutes should more data be necessary for study of transient events during the monitoring period.

In addition, the datalogging equipment operates under conditions ranging from -55 to +80 degrees centigrade. The datalogging equipment is housed in fiberglass-reinforced field enclosures designed for long term monitoring. CGS has used the equipment successfully on winter projects in the Lower Cook Inlet.

C. Contracts and Other Agency Assistance

Data analysis concerning hydrologic parameters collected by CGS will be a cooperative effort between CGS and ADFG. No agreements with other agencies have been made.

D. Location

Port Dick Creek is located at the head end of the West Arm of Port Dick Bay on the outer coast of the Kenai Peninsula as shown in Figure 1. Figure 2 shows the specific locations of sensors and datalogging equipment.

SCHEDULE:

A. Measurable Project Tasks for FY 96

July 1996:	Installation of Monitoring Equipment
September 1996:	Download first data set, check sensors and calibrate if needed
September 1996:	Analyze and present data to ADFG

B. Project Milestones and Endpoints

FY 96	1.	Equipment installation objective will be achieved in 2 days, in early July 1996, subsequent to the construction of the spawning channel.
	2.	Data collection in September
	3.	Data analysis and data report to ADFG, in September
FY 97	1.	Data collection in Nov., Jan., March, May, July 1997
	2.	Data Analysis and data report delivered to ADFG in same months, 1997
FY 98	1.	Data collection in Nov., Jan., March, May, July 1998
	2.	Data Analysis and data report delivered to ADFG in same months, 1998
FY 99	1.	Data collection in Nov., Jan., March, May, July 1999
	2.	Data Analysis and data report delivered to ADFG in same months, 1999
FY 00	1.	Data collection in Nov., Jan., March, May, July 2000
	2.	Data Analysis and data report delivered to ADFG in same months, 2000
FY 01	1.	Data collection in Nov., Jan., March, May, July 2001
	2.	Data Analysis and data report delivered to ADFG in same months, 2001
	3.	Demobilization.

C. Project Reports

Data reports are submitted to ADFG bimonthly for the life of the Port Dick salmon restoration project. Project reports will be submitted by ADFG to the Chief Scientist, however CGS will assist with the data analysis for the project reports.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT:

This instream habitat restoration project is the only EVOS related project on the Kenai Peninsula and LCI currently being considered for further funding, and no effort has yet been made to coordinate with other projects.

ENVIRONMENTAL COMPLIANCE:

All monitoring equipment used is contained in weather-tight enclosures, and all sensors are encased in inert materials such as stainless steel and titanium. However the monitoring equipment in this proposal can be used to help determine environmental compliance of the project if this is needed.

PERSONNEL:

Project Leader for long-term monitoring and analysis of physical parameters: Geoffrey R. Coble; Manager and Principal Investigator, Coble Geotechnical Services.

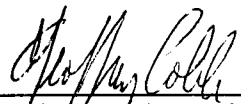
Mr. Coble has been employed as a hydrologist for the last 11 years in government (Kansas Geological Survey), private industry (Environmental Science and Engineering, Inc.) and his own firm (Coble Geotechnical Services). He has most recently provided long term hydrologic data collection at high sampling frequencies in field conditions for the City of Kenai and various Kenai Peninsula clients. He has considerable field experience in hydrologic monitoring and analysis (resume enclosed).

Nick C. Dudiak; Lower Cook Inlet Fisheries Resource Development Biologist.

Mr. Dudiak has been a fisheries biologist with the Alaska Department of Fish and Game for the last 17 years. He has been responsible for the commercial and sport fisheries rehabilitation and enhancement work in the Lower Cook Inlet area during those 17 years. In this capacity, he has been responsible for multi-disciplinary work involving the rehabilitation of depleted salmon stocks as well as enhancement activities that have created new and developing commercial and sport fisheries.

Mark Dickson, Fish and Wildlife Technician IV.

Mr. Dickson has been employed as a fish culturist and fish and game technician with the Alaska Department of Fish and Game for the past 17 seasons. He has considerable experience in fish cultural practices in the field and in the hatchery managing projects that restores and enhances sport and commercial fisheries in the Lower Cook Inlet area.



Geoffrey Coble, Project Leader- Long Term Monitoring and Analysis
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Project Manager
Alaska Department of Fish and Game
3298 Douglas
Homer, Alaska 99603

REFERENCES

Pauley, Gilbert B., Bowers, Karen L., and Thomas, Gary L., 1988. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates: Chum Salmon, US Fish and Wildlife Service Biological Report 82(11.81).

Wangaard, David B., and Burger, Carl V., 1983. Effects of Various Water Temperature Regimes on the Egg and Alevin Incubation of Susitna River Chum and Sockeye Salmon, US Fish and Wildlife Service, National Fishery Research Center, Alaska Field Station, Anchorage, Alaska.

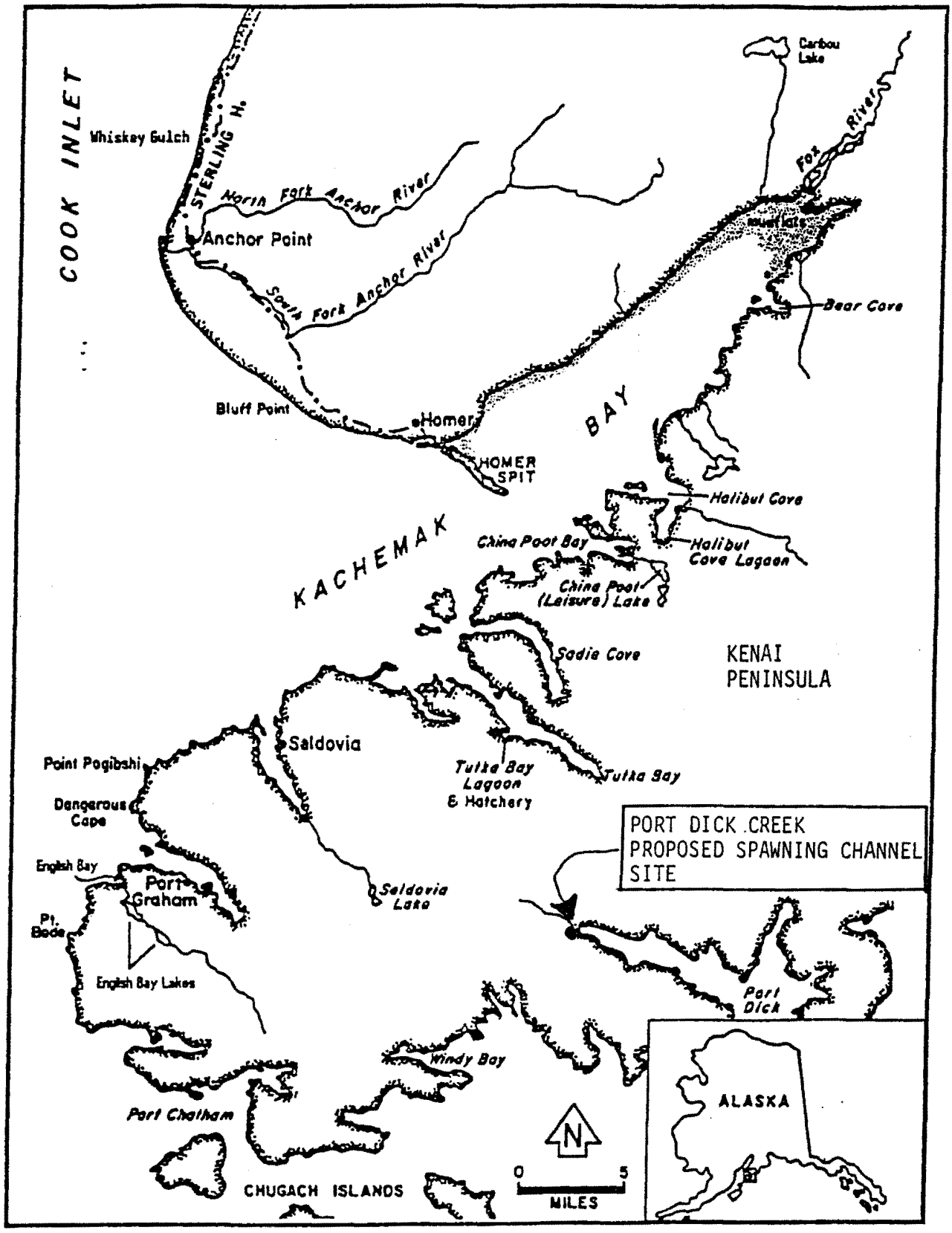

Figure 1. Location map of the Port Dick Creek Proposed Spawning Channel Site, Kenai Peninsula.

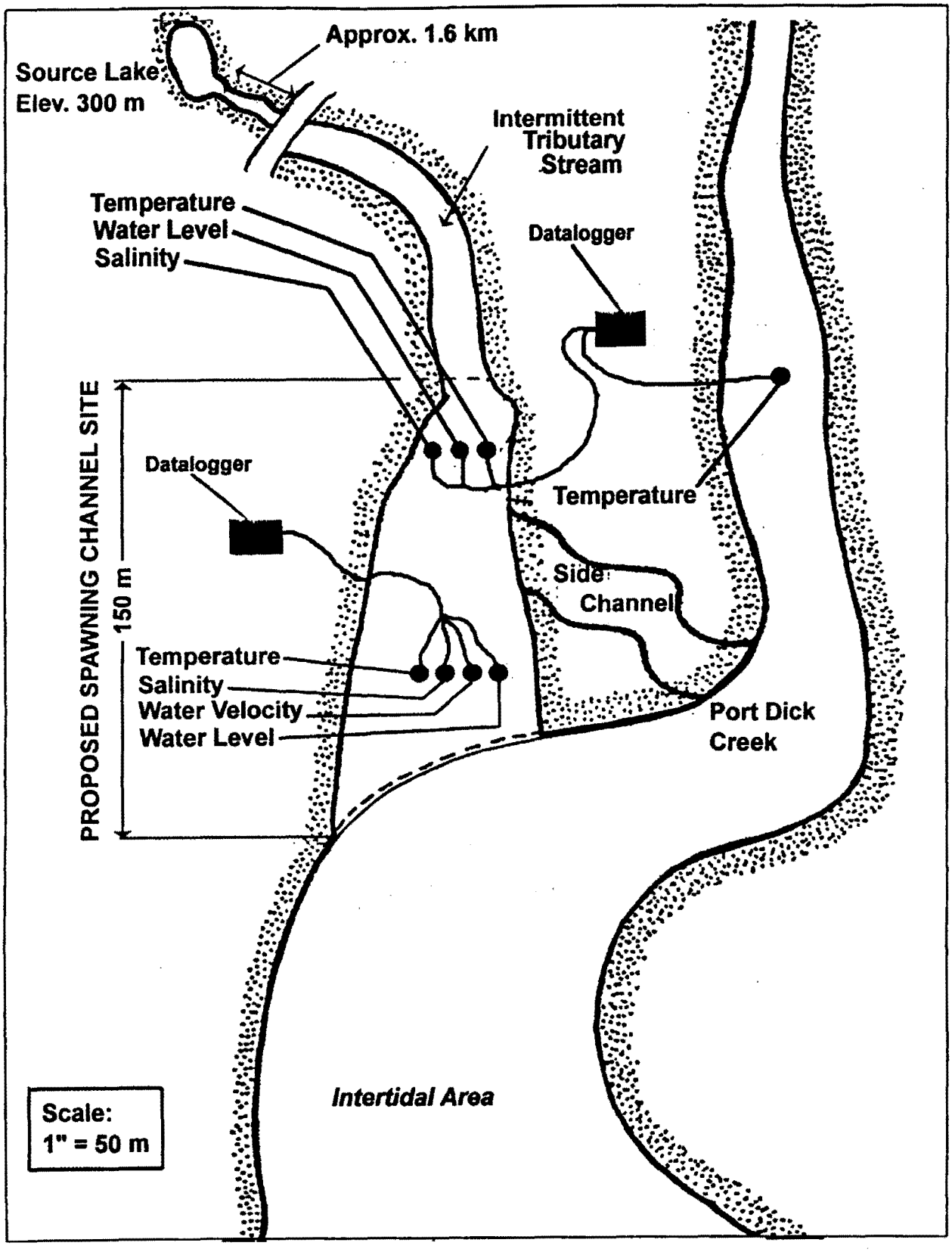

Figure 2. Physical parameter monitoring locations for Port Dick Creek and adjacent proposed spawning channel site.

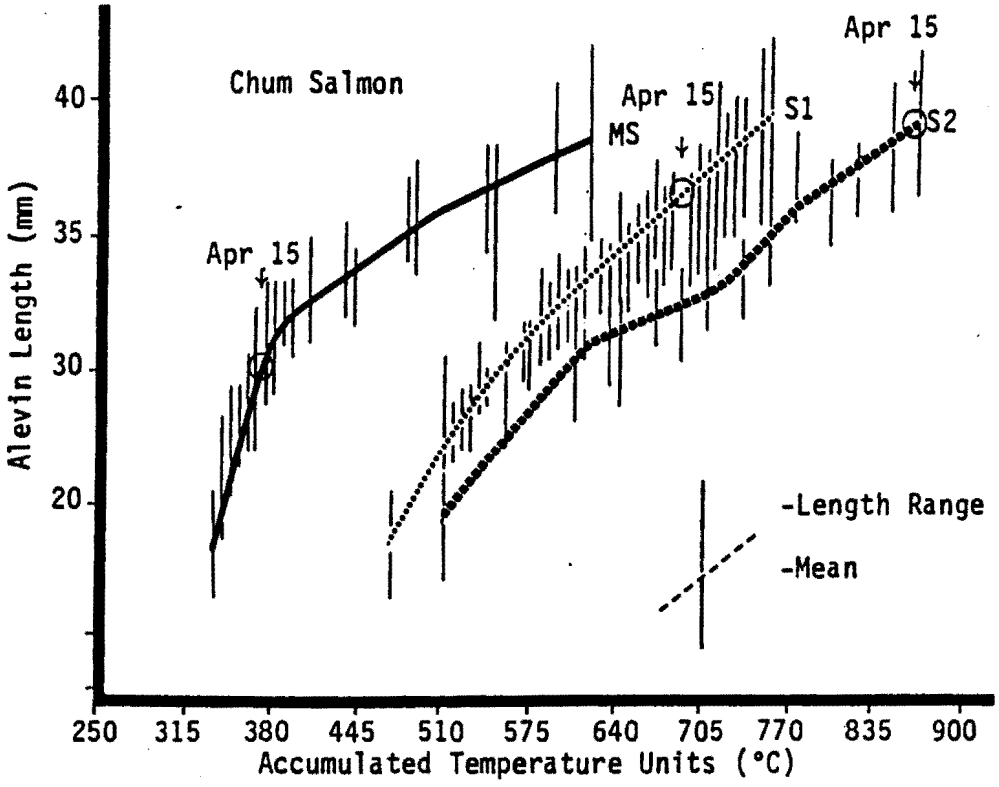

Figure 3. Alevin growth (total length) from 50% hatch to complete yolk absorption for chum salmon incubated at three different temperature regimes. The regimes simulated the Susitna main stem, slough, and an intermediary stream, Cook Inlet (from Wangaard et al., 1983)

GEOFFREY R. COBLE

ADDRESS

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EDUCATION

M.S. with Honors (1989)	Water Resources Science Department of Civil Engineering University of Kansas
B.S. (1989)	Geophysics Department of Geology University of Kansas
B.S. (1985)	Geology Department of Geology University of Kansas

PROFESSIONAL EMPLOYMENT

1994-present	Manager of **Coble Geotechnical Services**. Completed projects include a tidally-influenced groundwater contaminant transport flow evaluation for a confidential client in Homer, Alaska and a regional-scale pumping test for the City of Kenai.
1989-1994	Water Resources Scientist, Environmental Science and Engineering, Inc. Projects completed as a professional consultant include: the development of a wetlands model to determine groundwater-wetlands interactions altered by a major power utility, numerous (100+) water resources related modeling projects completed (including 3-D groundwater and contaminant transport numerical modeling for private sector and government projects), managing aspects of large water resources projects, field team leader for groundwater and geophysical data collection, routine report writing and computer programming (in UNIX, DOS and mainframe environments), verbal presentation of models to clients (such as other consulting firms, EPA and private industry), and professional development including seminars and conferences.

PROFESSIONAL EMPLOYMENT (continued)

1985-1989	Graduate Research Assistant, University of Kansas, Kansas Geological Survey, Geohydrology Section. Projects included research and field work for a large scale pumping test and for a ground water recharge project, analysis and computer modeling of unsaturated flow data, computer modeling of pumping test data and numerous smaller projects.
1987	Computer Programmer, University of Kansas, Kansas Geological Survey, Geohydrology Section. Computer programming for staff scientist Alan MacFarlane on a project-to-project basis. Duties included data management and computer graphics.
1984-1985	Student Research Assistant, University of Kansas, Kansas Center for Research Incorporated, Petrology Laboratory. Work involved using heavy liquids and a magnetic separator to obtain zircons for dating igneous rock. Duties included maintenance of detailed logs of lab work and frequent progress reports.
1983	Field Research Assistant. Duties were to assist in the analysis of the stratigraphy of the House Range near Delta, Utah. Field tasks included outcrop sketches, orientation measurements of stromatolites, sampling, and photography.

PROFESSIONAL AFFILIATIONS

American Geophysical Union
AIPG Certified Professional Geologist # 9088
Alaska Registered Professional Geologist # 376
National Ground Water Association
Alaska Geological Society (AGS)
Hazardous Materials/Waste Site Operations Training (OSHA 1910.120(e)(8))
American Water Resources Association, Alaska Section

PUBLICATIONS

G.R. Coble, 1995, Modeling the effects of groundwater withdrawal on wetlands, Alaska Water Issues Proceedings, American Water Resources Association, Alaska Section, WRC-117, Abstract.

G.R. Coble and R.A. Pisigan, 1992, Estimation of Contaminant Exposure Concentrations for Endangerment Assessment of an Army Depot, Society for Environmental Toxicology and Chemistry, Abstract.

PUBLICATIONS (continued)

P.A. MacFarlane, J.H. Doveton, and G.R. Coble, 1989, Interpretation of lithologies and depositional environments of the Cretaceous and Lower Permian rocks using a diverse suite of logs from a borehole in central Kansas, Journal of Geology, 17, 303-306.

G.R. Coble, 1989, Calculation of groundwater recharge for sites in the prairie bend region of Kansas, Kansas Geological Survey Open File Report 89-8, 178 pages.

M. Sophocleous, M. Townsend, L. Vogler, T. McClain, E. Marks, and G. Coble, 1988, Experimental studies in stream-aquifer interaction along the Arkansas River in central Kansas: field testing and analysis, Journal of Hydrology, 98, 249-273.

M. Sophocleous, M. Townsend, L. Vogler, T. McClain, E. Marks, and G. Coble, 1987, Stream aquifer interaction along the Arkansas River in central Kansas: field testing and analysis, 1987, Project compilation report to the Kansas Water Office, Kansas Geological Survey Open File Report 87-2, 90 pages.

REFERENCES

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Steve Denehan, Manager
Environmental Science and Engineering, Inc.
P.O. Box 1703
Gainesville, Florida 32602-1703
work phone: (800) 874-7872

Geoffrey Bohling, Kansas Geological Survey
1930 Constant Ave., Campus West, The University of Kansas
Lawrence, Kansas 66047
work phone: (913) 864-3965

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996						
Personnel		$3.4						
Travel		$1.7						
Contractual		$4.1						
Commodities		$0.0						
Equipment		$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$0.0	$9.2	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
Indirect								
Project Total	$0.0	$9.2	$16.5	$16.5	$16.5	$17.0	$17.0	
Full-time Equivalents (FTE)		6.0						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

Note 1) : This monitoring program reduces ADFG travel costs to the site (from every month to every 2 months).

Note 2): The 3-month FY/96 budget contains significant start-up costs, and is not representative of the monthly costs of the monitoring project. The monitoring program is proposed for the duration of the 5 year Port Dick salmon rehabilitation project.

1996

Prepared:

Project Number:
Project Title: Physical Parameter Monitoring, Proposed Spawning Channel Construction Project, Port Dick Creek, Lower Cook Inlet.
Name: G. Coble

FORM 4A
Non-Trustee
DETAIL

4/28/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:			Months	Monthly		Proposed
	Name	Position Description	Budgeted	Costs	Overtime	FFY 1996
	G. Coble	Field Hydrologist/Technician	3.0	150		0.5
	G. Coble	Hydrologic Data Analyst	3.0	960		2.9
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	6.0	1,110	0	
					Personnel Total	$3.4

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FFY 1996
	Float Plane for Instrument Installation	630	1	1	150	0.8
	Helicopter for Instrument Inspection, download data	780	1	1	150	0.9
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$1.7

1996

Project Number:
Project Title: Physical Parameter Monitoring, Proposed Spawning Channel Construction Project, Port Dick Creek, Lower Cook Inlet.
Name: G. Coble

FORM 4B
Personnel
& Travel
DETAIL

4/28/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:	Proposed
Description	FFY 1996
1 USGS Type AA (Price-Type) Current Meter, Digital, Rental	0.3
2 Pressure Transducer, Hastelloy diaphragm- stainless casing, Rental	0.6
3 Temperature Probe, Rental	0.2
2 Conductivity Probe, Rental	0.1
2 Datalogger, Rugged Full Bridge, Half Bridge and Pulse Mesurements, Rental	1.2
2 Solar Panel, 10 Watt, with charging regulater, Rental	0.2
1 Data downloading equipment (laptop, optical interface and keypad), Rental	0.1
2 Rechargeable 12 Volt Batteries, Rental	0.0
1 Shielded, twisted pair sensor cable, 300 feet, Rental	0.2
1 Installation supplies (mounting brackets, PVC pipe for exposed cable, mounting structure for datalogger), Rental	0.2
1 Business insurance coverage for equipment: FY/96	1.0
Contractual Total	$4.1

Commodities Costs:	Proposed
Description	FFY 1996
Commodities Total	$0.0

1996

Project Number:
Project Title: Physical Parameter Monitoring, Proposed Spawning Channel Construction Project, Port Dick Creek, Lower Cook Inlet.
Name: G. Coble

FORM 4B
Contractual & Commodities DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	

1996

Project Number:
Project Title: Physical Parameter Monitoring, Proposed Spawning Channel Construction Project, Port Dick Creek, Lower Cook Inlet.
Name: G. Coble

FORM 4B
Equipment
DETAIL

4/28/95

Afognak Island State Park - Habitat Restoration Survey

Project Number:	96141
Restoration Category:	General Restoration
Proposer:	ADNR
Lead Trustee Agency:	ADNR
Cooperating Agencies:	
Duration:	1 year
Cost FY 96:	$45,000
Geographic Area:	Afognak Island (Kodiak Island)
Injured Resource/Service:	Anadromous fish, marbled murrelet, bald eagle, and recreation

ABSTRACT

The objective of this project is to recommend ways to restore habitat in logged areas and along logging roads in Afognak Island State Park. The park was established in 1994 on land (Seal Bay and Tonki Cape parcels) purchased by the Trustee Council to protect the habitat of injured resources and services. A private contractor would conduct a regeneration survey that would document the density of seedlings that have returned to the 1200 acres that have been logged, and recommend ways to improve habitat (e.g., tree planting or thinning). The contractor would also recommend cost-effective ways to improve habitat along the 12 miles of logging roads within the park.

INTRODUCTION

The key element of the proposed project is a regeneration survey that will document the density of seedlings that have returned to logged areas in Afognak Island State Park. The purpose of the regeneration survey is to determine if actions such as tree planting or thinning are needed to restore habitat for injured resources and services. The survey would be conducted by a qualified specialist in forest management and/or silviculture under a competitively bid contract. As an adjunct to the regeneration survey, the contractor would also recommend cost-effective ways to restore habitat along logging roads.

The Alaska Department of Natural Resources (ADNR) initially proposed this project late in FY 95, when it was identified as Project 95141. The Trustee Council discussed the proposal at its December 1994 meeting, but deferred further consideration pending completion of peer

review and the Chief Scientist's recommendation. Peer review comments were received in March 1995 and the proposal has been modified to address concerns raised by the peer reviewer. However, because the optimum time for the survey is in the Spring, ADNR withdrew its FY 95 request and decided to resubmit it for FY 96.

The project was originally titled "Afognak Island State Park - Regeneration Survey," but has been changed to "Afognak Island State Park - Habitat Restoration Survey." The project title was changed to emphasize that the purpose of the proposed regeneration survey is to restore habitat, in contrast with the more common purpose of such surveys, which is to ascertain minimum stocking levels for commercial timber harvest.

Implementation of the recommendations generated by this project may take place many years into the future and may be supported by other funding sources. For example, if tree thinning is recommended, it probably would not take place until stands are 18 to 25 years old because it takes at least that long for tree dominance to be expressed. However, other recommendations may be able to be implemented sooner.

The proposed project will address land in the western part of Afognak Island State Park. In November 1993, the Trustee Council authorized purchase of 41,549 acres of land on northern Afognak Island (Seal Bay and Tonki Cape parcels). In May 1994, the Alaska State Legislature designated the land and water around Seal Bay and at Tonki Cape as Afognak Island State Park. About 1200 acres in the western part of Afognak Island State Park have recently been logged. About 65 percent of the area was logged in 1992 and the rest in 1993. There are about 12 miles (40 acres) of logging roads within the park, including mainline haul roads and spur roads. In general, these roads were pioneered with an excavator, overburden was removed to bedrock, and the bedrock was then ripped and shaped by dozer equipment.

The purchase agreement for the Seal Bay and Tonki Cape parcels requires the seller (Seal Bay Timber Company) to comply with applicable road closure requirements of 11 AAC 95.320 and applicable reforestation requirements of 11 AAC 95.375-390. The road closure regulations require stabilization of road surfaces through, for example, pulling culverts and removing bridges. Reforestation requirements establish minimum stocking levels of commercial tree species. Landowners in coastal areas like Afognak Island (Region I) are required to file a regeneration report within five years after timber harvest, but usually are not required to conduct a field survey.

NEED FOR THE PROJECT

A. Statement of the Problem

This project would develop recommendations to restore habitat for six resources and services injured by the spill: marbled murrelet, bald eagle, recreation, and anadromous fish (pink salmon, sockeye salmon, and Dolly Varden). In particular, this project would address three ways that logging and the natural revegetation patterns of logged areas may impede the recovery of these resources and services:

1. marbled murrelet and bald eagle may nest in mature Sitka spruce and may have lost substantial nesting area because of logging;

2. recreation uses that were damaged or lost because of the spill (including sport hunting, hiking, camping, and kayaking) rely on an open understory for access through forested areas as well as scenic quality, and both factors would be diminished if natural reforestation produces an unnaturally dense stand of trees; and

3. erosion along logging roads and at stream crossings may degrade water quality and riparian habitat in anadromous fish streams.

Of the injured resources and services addressed by this project, only bald eagles appear to be recovering. The recovery of Dolly Varden is unknown.

Within a forest, natural processes such as insect infestations, disease, and wind can produce scattered open areas, which tend to be revegetated with dense stands of even-aged trees. In contrast, clearcutting tends to produce larger areas of dense stands of trees than would be natural.

If a recently logged area has too many Sitka spruce seedlings (overstocked), timber stands will become so dense that mature tree size will be delayed, and excessive shade will depress species diversity, biomass, and productivity in the understory. In such cases, thinning seedlings may speed recovery to a more natural forest structure and enhance the growth of remaining trees. Conversely, if an area has too few seedlings or Sitka spruce has not yet begun to pioneer the area, tree planting may be an appropriate way to restore habitat.

Natural revegetation of logging roads poses a different challenge. If the roadbeds remain as they are, scraped down to bedrock, it will take many decades for a soil layer to form and for Sitka spruce to break through the understory. Typical vegetative succession begins with alder growth. Alder is an efficient colonizer: it will quickly establish itself in areas that were disturbed by roadbuilding. Soil will form on the roadbed as surrounding vegetation deposits detrital material. Within 10 to 12 years, the alder will probably be so dense that the road becomes impassable. Sitka spruce seedlings are usually growing in the thin layer of soil. In an unaided scenario, succession to an old-growth forest could take a century or more.

The logging roads in Afognak Island State Park cross numerous anadromous streams. Bridges and culverts have already been removed, eliminating the greatest source of erosion. However, erosion potential may still exist at stream crossings. If erosion occurs at these spots, water quality and riparian habitat in anadromous fish streams may be degraded, thereby reducing survival.

B. Rationale

This project would develop recommendations for restoring habitat for six resources and services injured by the spill: marbled murrelet, bald eagle, recreation, and anadromous fish (pink salmon, sockeye salmon, and Dolly Varden). Specific objectives of the project are the same as those for acquisition of the land, that is, to:

1. maintain adequate water quality and riparian habitat for spawning and rearing for anadromous fish,

2. maintain adequate nesting habitat for marbled murrelets and bald eagles, and

3. preserve and enhance the recreational opportunities offered by the spill area.

The *Restoration Plan* calls for protection of the habitat of all injured resources and services regardless of their recovery status, because habitat is crucial to sustained recovery.

This project would generate three products:

1. recommendations for cost-effective ways of restoring habitat along logging roads,

2. a regeneration survey of logged areas within Afognak Island State Park, and

3. recommendations for restoring habitat in logged areas.

C. Summary of Major Hypotheses and Objectives

The objective of this project is to recommend ways to restore habitat in logged areas and along logging roads in Afognak Island State Park.

D. Completion Date

Regeneration surveys typically occur three to four years after harvest to allow time for significant natural revegetation. Surveys are usually conducted in late spring, after the snow has melted, but before greenup. Because timber within Afognak Island State Park was logged in 1992 and 1993, late Spring 1996 will be an ideal time to conduct the regeneration survey. The contractor will complete a draft project report by the end of September 1996. Peer review, revision of the draft report, and preparation and reproduction of the final report will take place in FY 97, but associated costs will be included in the contract, which will be issued in FY 96.

COMMUNITY INVOLVEMENT

Although there is presently no modern community on Afognak Island, Seal Bay is the ancestral homeland of former residents of the abandoned village of Afognak. Villagers from Old Afognak relocated to Port Lions after the 1964 earthquake and would be able to provide valuable traditional knowledge about the area. The contractor will be required to confer with the community of Port Lions before the field survey to acquire traditional knowledge about the site and again after the survey to brief them on its results and potential recommendations. In addition to contacting village leaders, the contractor will be required to conduct a community meeting with maps to facilitate two-way communication about site-specific conditions. A representative from Alaska State Parks will accompany the contractor on these visits to the community.

FY 96 BUDGET

The proposed budget for FY 96 is higher than initially proposed in FY 95. The additional cost reflects the anticipated expense of community involvement (two trips to Port Lions), quality control of the regeneration survey, revision of the draft report in response to peer review comments, and reproduction of the requisite number of copies of the final report.

Personnel	5.6
Travel	0.0
Contractual	36.0
Commodities	0.0
Equipment	0.0
Subtotal	41.6
Gen. Admin.	3.4
Total	45.0

PROJECT DESIGN

A. Objectives

The objective of this project is to recommend ways to restore habitat in logged areas and along logging roads in Afognak Island State Park.

B. Methods

1. ADNR prepares a request for proposals, solicit bids, and issues a contract to a qualified specialist in forest management and/or silviculture.

2. The contractor conducts a field survey that:

   a. gathers site-specific information necessary to properly develop rehabilitation measures along logging roads,

   b. assesses the windfirmness of the cut forest - mature forest edge and riparian buffers, and the exposure to further damage because of the existence of edge and buffers,

   c. documents the density of seedlings in logged areas, and

   d. assesses the need for thinning or additional seeding, noting the best location and timing of such actions, and

3. Quality control. An ADNR forester validates the accuracy of the regeneration survey. This is a relatively small effort that will require at most a day or two in the field.

4. Prepare report. The contractor will prepare a report that documents the field survey and recommends actions to restore habitat within logged areas and along logging roads. Recommendations for management measures must fit into the natural disturbance system characteristic of the local environment, reflecting consideration of such factors as insects, wind, flooding, and disease.

5. Submit report. DNR submits the report to the Chief Scientist. If substantial revisions are required, the final report may not be completed until FY 1997.

C. Contracts and Other Agency Assistance

A competitively bid contract would be issued to a qualified specialist in forest management and/or silviculture.

D. Location

Logged areas within the western part of Afognak Island State Park.

SCHEDULE

A. Measurable Project Tasks for FY 96

Start-up to January 31:	Issue request for proposals.
March 31:	Issue contract.
May - June:	Conduct field survey.
July - September:	Prepare draft report.
September 30:	Submit draft report.

B. Project Milestones and Endpoints

The endpoint of this project will be recommendations for restoring the habitat of injured resources and services. These recommendations will be used by ADNR to manage logged parcels within Afognak Island State Park to achieve the restoration purposes for which the land was acquired.

Milestones:

1. Regeneration survey field work will be completed by the end of June 1996.

2. Draft report with recommendations for restoring habitat will be completed by September 30, 1996.

3. Final report revised in response to peer review comments will be completed during the term of the contract, possibly by March 1997 if the review process proceeds expeditiously.

C. Project Reports

The report will include at least the following items:

1. reforestation stocking levels of each timber harvest unit,

2. map detailing the stocking levels within the units,

3. recommendations for actions to restore habitat within logging areas and along logging roads, including specific locations and time periods for such actions.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Although this project is not closely related to other restoration projects, the data from the regeneration survey may be useful for future restoration or resource management projects. To enable future projects to tap the data generated from this project, the contractor will be required to provide as much geographic specificity as possible and to incorporate the data into a permanent archive. The details of this arrangement will be developed in coordination with the Trustee Council's Information Management System before a request for proposals is issued.

The regeneration survey will also be coordinated with the Sitka Spruce Province Study being conducted by the Institute of Northern Forestry in Fairbanks.

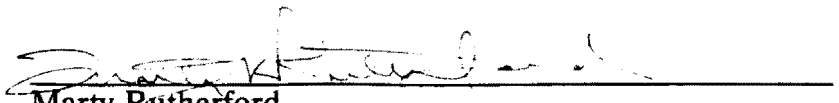
The proposed project is not a normal agency activity for ADNR. ADNR is under no obligation to conduct a regeneration survey or to restore habitat on logged areas or along logging roads. The Alaska Forest Practices Act does not require a regeneration survey and the Alaska State Legislature did not require habitat restoration when in the legislation establishing Afognak Island State Park.

ENVIRONMENTAL COMPLIANCE

The project will comply with all applicable regulations. The U.S. Forest Service is the most logical federal lead agency for compliance with the National Environmental Policy Act. Field surveys of the kind proposed in this report are typically considered categorical exclusions.

PERSONNEL

The project will be managed by Claire Holland, Kodiak District Ranger, Alaska State Parks, with assistance from Wade Wahrenbrock, Forest Practices Forester, ADNR Division of Forestry. The principal investigators for the project will be determined through a competitive procurement process.



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Date Prepared: May 1, 1995

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS					
			Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
Personnel		$5.6						
Travel		$0.0						
Contractual		$36.0						
Commodities		$0.0						
Equipment		$0.0						
Subtotal	$0.0	$41.6						
General Administration		$3.4						
Project Total	$0.0	$45.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Full-time Equivalents (FTE)		0.1						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments: The objective of this project is to recommend ways to restore habitat in logged areas and along logging roads in Afognak Island State Park. The park was established in 1994 on land (Seal Bay and Tonki Cape parcels) purchased by the Trustee Council to protect the habitat of injured resources and services. A private contractor would conduct a regeneratiion survey that would document the density of Sitka spruce seedlings that have returned to the 1200 acres that have been logged, and recommend ways to improve habitat (e.g., tree planting or thinning). The contractor would also recommend cost-effective ways to improve habitat along the 12 miles of logging roads in the park.

1996

Prepared:

Project Number: 96141
Project Title: Afognak Island State Park - Habitat Restoration Survey
Agency: ADNR

FORM 3A
AGENCY
PROJECT
DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
	Vacant	Kodiak District Ranger, Project Manager	16	1.0	5,088	0	5.1
	Vacant	Forester	16	0.1	5,088		0.5
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		1.1	10,176	0	
Those costs associated with program management should be indicated by placement of an *.						**Personnel Total**	$5.6

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

1996

Project Number: 96141
Project Title: Afognak Island State Park - Habitat Restoration Survey
Agency: ADNR

FORM 3B
Personnel
& Travel
DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:	Proposed
Description	FFY 1996
Subcontract with a qualified professional in forest management and/or silviculture. The subcontractor will be determined through procurement process.	35.0
Charter flights for the project manager to travel to Afognak Island to oversee the field survey, and to Port Lions to attend community meetings.	1.0
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$36.0

Commodities Costs:	Proposed
Description	FFY 1996
Commodities Total	$0.0

1996

Project Number: 96141
Project Title: Afognak Island State Park - Habitat Restoration Survey
Agency: ADNR

FORM 3B
Contractual & Commodities DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	Inventory Agency

1996

Project Number: 96141
Project Title: Afognak Island State Park - Habitat Restoration Survey
Agency: ADNR

FORM 3B
Equipment
DETAIL

96142-BAA

STATUS AND ECOLOGY OF KITTLITZ'S MURRELET IN PRINCE WILLIAM SOUND

EXXON VALDEZ RESTORATION PROJECT PROPOSAL
Broad Agency Announcement (50ABF500082)

Prepared for:

Exxon Valdez Oil Spill Trustees Council
Anchorage Restoration Office
645 G. St, Suite 401
Anchorage, AK 99501

By:

ABR, Inc.
P.O. Box 80410
Fairbanks, AK 99708

29 April 1995

STATUS AND ECOLOGY OF KITTLITZ'S MURRELET IN PRINCE WILLIAM SOUND
Submitted Under the BAA

Project Number:	96142-BAA
Restoration Category:	Research
Proposer:	ABR, Inc.
Lead Trustee Agency:	
Duration:	Six years
Cost FY 96:	$110,200
Cost FY 97:	$142,600
Cost FY 98:	$149,800
Cost FY 99:	$157,300
Cost FY 00:	$165,100
Cost FY 01:	$38,400
Geographic Area:	Prince William Sound
Injured Resource:	Kittlitz's Murrelet

ABSTRACT

We propose to investigate the status and ecology of Kittlitz's Murrelet, a rare seabird breeding in glaciated fjords of Prince William Sound (PWS). Our study will evaluate the abundance, distribution, and productivity of this little known seabird and assess its habitat use and feeding habits in northwestern PWS. Given uncertainty about the effects of the *Exxon Valdez* oil spill on this species, a better understanding of its status and ecology is required to ensure its long-term conservation.

INTRODUCTION

This study will investigate the population status, population trends, and breeding and feeding biology of Kittlitz's Murrelet (*Brachyramphus brevirostris*) in northern Prince William Sound (PWS). We will evaluate the abundance, distribution, and productivity of this little known seabird, and will assess its habitat use and food habits.

The primary reason this study is needed is the small population size and restricted distribution of this rare seabird, and uncertainty about impacts from the *Exxon Valdez* oil spill and the species population trends after the spill. The world population of Kittlitz's Murrelets has been estimated to be as low as 20,000 birds, with the majority residing in Alaska (van Vliet 1993). The magnitude of mortality from the oil spill for the species is unknown, but one estimate was that 5–10% of the total population may have been lost, which would be the highest reduction in population known for any species affected by the oil spill (van Vliet and McAllister 1994). Because of a lack of information, the *Exxon Valdez* Oil Spill Trustee Council (1995) had not listed Kittlitz's Murrelet as "injured", but they are considering changing its status to "unrecovered."

Kittlitz's Murrelets are small alcids that nest solitarily in remote areas of Alaska and the Russian Far East (A.O.U. 1983, Day et al. 1983). Because of their low nesting density, the extreme difficulty of finding their nests, and the paucity of surveys in their preferred nesting habitat (talus slopes), only 21 nests of

this species have ever been located (Day et al. 1983, Day 1995). Based on the small sample of nests, Day et al. (1983) and Day (1995) suggested that the species is adapted to nesting in rocky, poorly vegetated talus slopes that occur at high elevations in the southern part of their range and at lower elevations in the northern part of their range.

Knowledge is lacking about the nesting phenology and breeding biology of Kittlitz's Murrelets anywhere in their range. For example, the incubation period is not known (but probably ~30 days, as in the Marbled Murrelet *Brachyramphus marmoratus*; Sealy 1974), and the fledging period has been determined (for only one nest) to be ~24 days (J. F. Piatt, National Biological Service, pers. comm.), slightly shorter than that for the Marbled Murrelet (27–28 days; Simons 1980; Hirsch et al. 1981). Synthesizing records of eggs in birds, eggs and young in nests, hatching and laying dates, and fledging dates, Day (in preparation) has derived the following estimates of basic aspects of nesting phenology in southcoastal Alaska (including PWS): known or probable egg-laying dates are 27 May–17 June, hatching dates are 26 June–17 July, and fledging dates are 20 July–10 August.

Food habits and feeding ecology of Kittlitz's Murrelets also are poorly understood. The few specimens that have been examined in the Gulf of Alaska (from Kodiak Island; Vermeer et al. 1987) fed on euphausiids (*Thysanoessa inermis* and *T. spinifera*) and on fishes (Pacific sandlance [*Ammodytes hexapterus*], post-larval capelin [*Mallotus villosus*], Pacific herring [*Clupea harengus*], Pacific sandfish [*Trichodon trichodon*] and unidentified fishes)(Sanger 1987). Information on food habits thus far suggests that Kittlitz's Murrelet functions primarily as a secondary carnivore (Sanger 1987). However, no data are available on feeding habits in the glaciated fjords that represent the primary habitat of this species in summer.

Information on habitat use by Kittlitz's Murrelets is nearly nonexistent. In PWS, they are found primarily in the glaciated fjords of the northern and northwestern Sound (Isleib and Kessel 1973). Unakwik Inlet in particular has been reported to be used by large numbers of Kittlitz's Murrelets (Isleib and Kessel 1973).

Given this rare seabird's small global population and uncertainty about population trends and threats, Kittlitz's Murrelet currently is classified a Category 2 Candidate Species under the Endangered Species Act (U.S. Fish and Wildlife Service, Anchorage, memorandum of January 1995). This category includes species for which "the best available scientific and commercial information indicates that it might qualify for protection under the Endangered Species Act, but the Service needs additional information on vulnerability and threats before the qualifications for listing can be determined." The proposed research described here is designed to provide new information on population status and basic biology of Kittlitz's Murrelets, which is necessary for effective conservation of the species.

NEED FOR THE PROJECT

A. Statement of Problem

Although Kittlitz's Murrelet is not currently on the Trustee Council's official list of injured resources, it has been proposed as an addition to the list (letter dated 15 June 1994 from K. Kuletz, National Biological Service, to the *Exxon Valdez* Oil Spill Trustee Council), and its status is being evaluated by the Chief Scientist (*Exxon Valdez* Oil Spill Trustee Council 1995). Little is known about the effects of the *Exxon Valdez* oil spill on the Kittlitz's Murrelet, but van Vliet and McAllister (1994) recently

suggested that Kittlitz's Murrelet was the species suffering the greatest impact from the spill. Extrapolating from the small number of dead Kittlitz's Murrelets collected after the spill, and making assumptions about the proportion of Kittlitz's among unidentified murrelet carcasses, those authors estimated that 1,000–2,000 Kittlitz's Murrelets may have been killed directly by oil. This number represents 5–10% of the estimated world population of this species (20,000 birds; van Vliet 1993). Problems with identification and counting (van Vliet and McAllister 1994) introduce a high degree of uncertainty in these estimates. Field studies after the oil spill were unable to measure impacts on Kittlitz's Murrelets either because they were not distinguished adequately from Marbled Murrelets (Klosiewski and Laing 1994), which closely resemble Kittlitz's Murrelets, or because this species was not abundant enough in another study's sample to permit statistical analysis (Day et al. in press, in prep.; Murphy et al. in prep).

B. Rationale

The Kittlitz's Murrelet is perhaps the most poorly understood seabird in North America. The small size of its world population, its restricted distribution, and uncertainty over the impacts on its population from the *Exxon Valdez* oil spill, manifest a high risk of population decline and extinction for this species. This risk was recognized by the U.S. Fish and Wildlife Service when it classified the Kittlitz's Murrelet as a Category 2 Candidate species under the Endangered Species Act, which means that it might be placed under protection of the Act, but more data are needed before a determination is made. So little is known about the biology of this species that any data collected will help managers and scientists define conservation goals and research needs for the population.

Our study will provide crucial information on population status and trend over a 5-year period, so that we can begin to identify whether the Kittlitz's populations in portions of PWS are declining and at immediate risk. We will evaluate distribution and habitat use during the breeding season, to obtain a basic understanding of where Kittlitz's Murrelets nest and feed during that critical time. Finally, we will describe the feeding habits of the species in glaciated fjords so that their trophic role can be better defined and related to population trends. The Sound Ecosystem Assessment and the Seabird Forage Fish Project are studying potential changes in the marine environment and forage species, which may have effects on Kittlitz's Murrelets. However, such effects can only be assessed after their feeding ecology is clearly understood. The information gathered in this study will provide population trend data that are needed by the Trustee Council to classify the status of this species with respect to the oil spill. Of equal importance is the fact this study will provide a baseline from which to monitor long-term population changes, which will be essential for efforts to conserve the species.

C. Summary of Major Hypotheses and Objectives

The primary goal of this study will be to evaluate the abundance and distribution of Kittlitz's Murrelets and describe important aspects of its biology in three glaciated fjords in northern PWS (Unakwik Inlet, Barry Arm/Harriman Fjord, and College Fjord). The objectives for the first year's work are to: (a) conduct population surveys in each fjord; (b) estimate population sizes for each fjord; (c) examine the overall distribution and habitat use in each fjord; (d) develop and measure indices of reproductive performance; and (e) describe food habits.

Major hypotheses will address population trends and habitat use. The null hypothesis for population trends is that there is no among-year change in overall population size. The null hypothesis for the habitat-use component is that all habitats are used in proportion to their availability. The null hypothesis

for reproductive performance is that the proportion of young does not vary among years. Additional hypotheses involving reproduction and food habits will be generated as the study develops.

D. Completion Date

Data collection will occur during the summers of 1996–2000 (i.e., FY 96–FY 00). Annual reports will be completed the following fiscal year (e.g., the annual report for summer 1996 will be completed in FY 97). The final report will be completed during FY 01.

COMMUNITY INVOLVEMENT

In each year of study we will contract a vessel and crew from PWS to provide berthing and logistic support. We will provide articles and photographs for the Trustee Council Newsletter and will be available to make public presentations of our study at appropriate forums. These articles and presentations will disseminate information on the objectives and major findings of this study to the general public.

FY 96 BUDGET

The estimated cost for FY 96 includes management, mobilization, and data collection. Data analysis and report writing will not be completed before the end of FY 96 (30 September), so costs associated with these tasks are carried over into the budget for FY 97.

Personnel	61.2
Travel	2.1
Contractual	44.5
Commodities	2.4
Equipment	0.0
Subtotal	110.2
Indirect Costs	0.0
Total	110.2

PROJECT DESIGN

A. Objectives

1. To conduct population surveys for Kittlitz's Murrelets in three fjords in northwestern PWS.

2. To estimate population sizes and determine population trends for each fjord and the northwestern PWS area as a whole.

3. To determine overall distribution and habitat use in each fjord.

4. To develop and measure indices of reproductive performance.

5. To describe feeding habits in these glaciated fjords.

B. Methods

This study proposes investigating aspects of the ecology of this species during two cruises per year over five years of sampling. Cruises will be 18 days long each and will be conducted in late May–early June (early summer) and late July–early August (late summer). During each cruise, we will sample three fjords in northern PWS two times each: Unakwik Inlet, Barry Arm/Harriman Fjord, and College Fjord. Each sample replicate will consist of two types of sampling: nearshore surveys and offshore surveys to measure population size, population trends, habitat use, and reproductive performance. Each cruise also will include sampling of stomach contents of birds to elucidate food habits in these glaciated fjords.

Hypothesis 1: Population size does not differ among years. Population data from nearshore surveys will be used to compare pre-spill (where possible) with post-spill counts and to compare post-spill counts among years. Nearshore surveys have been conducted in this region by Irons et al. (unpublished report), Klosiewski and Laing (1994), Murphy et al. (in prep.), and Day et al. (in press; in prep.), and we will use methods common to these studies. In each of the three fjords, we will use a small (<7 m long) open boat with an outboard motor to travel at <20 km/h parallel to the shoreline. We will identify and count all Kittlitz's (and Marbled) Murrelets on the water ≤200 m from the shoreline or flying over that zone. Fjord shorelines will be divided into segments 3–5 km long using the same segment boundaries as were used by Irons, Nysewander, and Trapp (U.S. Fish and Wildlife Service, unpublished manuscript) and Klosiewski and Laing (1994) for nearshore surveys. By using the same segment boundaries, comparisons also can be made with those data to examine population trends. Paired t-tests of numbers of birds in each segment will be used to provide powerful tests for examining trends in abundance among years (Murphy et al., in prep.) within each fjord. Nearshore counts will be converted to densities by dividing the number of birds on a segment by the area in the segment boundaries and within 200 m of the shoreline. Areas for shoreline segments will be calculated from digitized maps measured with Geographic Information System (GIS) software. Nearshore densities will be used in a multi-factor analysis described below.

Related to hypothesis 1 are subordinate hypotheses about differences among fjords and differences among nearshore and offshore zones. Offshore surveys have been conducted in the PWS region by Klosiewski and Laing (1994) and Day et al. (in press; in prep.). For offshore surveys, we will use a modified strip-transect sampling technique also used by the USFWS (Gould et al. 1982, Gould and Forsell 1989) to sample a transect line that is fixed geographically down the centers of these three fjords. In each fjord, we will identify and count all Kittlitz's (and Marbled) Murrelets seen ≤300 m from one side of the research vessel. We then will calculate the density of birds for each bay-visit by dividing the total count by the total area sampled (trackline length × 300 m total width). As will be done for nearshore surveys, the offshore survey trackline will be divided into segments for later analysis of use of different parts of a bay and for examining trends in abundance among years. Paired t-tests of numbers of birds in each segment will be used to test for trends in abundance among years within each fjord. A multi-factor analysis of variance (ANOVA) will be used to test for differences in densities among years, among fjords, among zones (nearshore vs. offshore) and among two-way interaction terms. Densities will be transformed as needed to normalize the data. This analysis will evaluate the sources of variability in murrelet densities and whether potential changes in densities among years are consistent among fjords and among zones.

Population size of Kittlitz's Murrelets in each fjord will be estimated using a combination of data from the nearshore and offshore surveys. Data from nearshore surveys will be treated as a census of birds in that zone. Data from offshore surveys will be calculated as densities, and those densities will be multiplied by the area of the entire fjord beyond the nearshore zone (i.e., area >200 m from shore calculated with GIS software) to estimate the number of birds in the offshore zone. These two numbers then will be added together to estimate the total population size for that fjord during that visit. This technique has been used to estimate total population sizes of individual species of birds in other bays of PWS (Wiens et al., in review). The estimates of population size will not be used in any test of hypotheses, but will be used for descriptive purposes. Inferences about population change and variation will be provided by analyses of density from nearshore and offshore surveys as described above.

Hypothesis 2: Habitat use by Kittlitz's Murrelets does not differ from habitat availability in glaciated fjords of northern PWS. Habitat use will be examined by stratifying each fjord and the sampling segments of both nearshore and offshore surveys into five strata: (a) nearshore zone/affected by glacier; (b) nearshore zone/not affected by glacier; (c) offshore zone/affected by glacier; (d) offshore zone/not affected by glacier; and (e) submarine glacial sill. During surveys, we will map locations of Kittlitz's Murrelets seen on the water and will use these data later to calculate densities of birds in each stratum. We will use two-way analysis of variance, log-linear models, and/or logistic regression to test for differential use of habitats within and among fjords, depending on the distribution of murrelet numbers among habitat strata and among fjords.

Hypothesis 3: Reproductive performance does not differ among years or among fjords. We will test this hypothesis contingent on our success at developing criteria for identifying juvenile birds. In both nearshore and offshore surveys, we will classify birds into (1) breeding plumage (probably adult); (2) winter plumage (unknown age if seen in early summer, when some adults may be molting back into breeding plumage; probably subadult if seen later in summer); (3) juvenile plumage (should be seen only on the late-summer cruise); or (4) unknown plumage. The percentage of birds in juvenile plumage during the late summer cruise will provide an index of reproductive performance for comparison among years. Differences among years and among fjords will be evaluated with a two-way analysis of variance after the data have been normalized (e.g., with arcsine-squareroot transformation).

Hypothesis 4: A hypothesis about food habits will be developed after the first year of data collection. No hypothesis has been developed for the first year of food habits study because no baseline information exists from PWS, so the initial effort necessarily will be to describe the foods being used and their proportions in the diet of Kittlitz's Murrelets. We will collect up to 10 feeding Kittlitz's Murrelets in each fjord during each cruise, for a maximum of 30 food habits samples/cruise. We will attempt to collect birds in two habitats if they are feeding there: (1) upwelling zones near the faces of glaciers and (2) open water farther down the fjords and away from glaciers. We will take standard measurements of all specimens collected and will examine all for reproductive status. Food items in each bird stomach will be preserved, identified to the lowest possible taxon, counted, and weighed. We will then calculate an Index of Relative Importance (IRI) for each taxon, following the method described by Day and Byrd (1989).

C. Contracts and Other Agency Assistance

We will contract a research vessel (~16 m) and crew from PWS to provide berthing, logistic support, and a platform from which to conduct offshore surveys. All field and office work will be conducted by ABR, Inc.

D. Location

Field work for the project will be conducted in northwestern PWS. All other work will be conducted in Fairbanks.

SCHEDULE

A. Measurable Project Tasks for FY 96

January–March 1996:	Arrange logistics (boats, equipment, collecting permits, etc.)
≈27 May–≈15 June 1996:	Conduct early summer cruise
≈20 July–≈8 August 1996:	Conduct late summer cruise
August–September 1996:	Analyze stomach contents
August–September 1996:	Keypunch data and QA/QC
August–September 1996:	Digitize data, measure geographic data, and QA/QC
15 April 1997:	Submit Annual Report on FY 96 research

B. Project Milestones and Endpoints

1. " To conduct population surveys for Kittlitz's Murrelets in three fjords in northern PWS." Field work will begin in FY 96 and will continue during all five years of the study.

2. "To estimate population sizes and determine population trends for each fjord and the area as a whole." Population sizes will be estimated and will be tested for annual differences during each year of study.

3. "To determine overall distribution and habitat use in each fjord." Mapped distributions and densities of birds in each habitat stratum will be compared each year for individual cruises. Habitat strata will be evaluated and revised each year, if necessary.

4. "To develop and measure indices of reproductive performance." Data on numbers of juvenile birds will be recorded during each late summer cruise, and an index of reproductive performance (the percentage of all birds seen that were juveniles) will be compared among fjords and among years each year of study. The reproductive performance index will be evaluated for its effectiveness and practicality, and will be revised, as necessary, after the first year of study.

5. "To describe food habits in these glaciated fjords." Food habits data will be analyzed for each fjord and habitat during each year. We realize that sample sizes may be small within a cruise, fjord, and habitat but do not want to commit to more extensive collecting until we know how much variation there is among sites in feeding areas and food habits. Thus, the food habits component should be considered a pilot study for FY 96, until we are assured that it yields data of sufficient value to justify collecting birds.

C. Project Reports

We will submit annual reports during the first four years of the study. Each report will be submitted to the Chief Scientist no later than 15 April of the year following data collection and will cover data collected during that year. Those reports also will synthesize and compare results for that year and previous years. After the final year of data collection, we will submit a final report that will synthesize and compare results from all five years of the study.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

To our knowledge, no other Trustees studies are being conducted in these glaciated fjords of northwestern PWS. Hence, integration will be difficult in view of the differences between these fjords and other environments in PWS. However, if the food-habits data indicate that the birds are eating large amounts of fishes, we may be able to integrate our study with the Seabird/Forage Fish Study. We definitely would be able to take advantage of information that that study and the Sound Ecological Assessment generates on the biology of fish and invertebrate prey species.

We have no cofunding source for this project.

The project will be valuable in that it will assist the U.S. Fish and Wildlife Service in learning about a Category 2 species under their management and will provide information crucial to the conservation of the species. The data on population trends will help in evaluating whether this species is declining in the center of its range in PWS. Investigation of habitat use, reproductive performance, and food habits will be the initial step in increasing the baseline knowledge of the biology of this poorly understood species.

ENVIRONMENTAL COMPLIANCE

Federal and state regulations will need to be complied with for the collection of birds.. If we are awarded this contract, we will secure collecting permits from both federal and state agencies and will comply with conditions associated with those permits.

PERSONNEL

Dr. Robert H. Day will be the Project Leader/Principal Investigator for the project. Dr. Day has conducted research on seabirds, marine ecology, impacts of marine pollution, and marine conservation topics in Alaska for 20 years (Appendix 1). His research topics have included the biology of poorly known seabirds in Alaska; the ingestion of plastic pollutants by seabirds in Alaska; the mortality of seabirds in the high-seas drift-gillnet fishery of the North Pacific; and the distribution, abundance, and decomposition of plastic pollution and other marine debris in the North Pacific. Recently, he conducted several years of research on impacts of the *Exxon Valdez* oil spill on habitat use by marine-oriented birds and on bird communities (sponsored by Exxon Company, USA. Dr. Day has been contracted by the AOU to write the species account of Kittlitz's Murrelet in the Birds of North America project. Dr. Day will be assisted in studies by a another qualified ABR biologist (who will be named later, if the project is funded).

Dr. Day is employed by ABR, Inc. (formerly Alaska Biological Research, Inc.). ABR is an Alaskan-owned small business—headquartered in Fairbanks since its formation in 1976—that specializes in

environmental research and services. During nearly two decades of operation in Alaska, ABR has served a variety of clients, including private industry, state and federal government agencies, and the University of Alaska. During this time, ABR has developed a reputation for conducting objective research that provides the basis for sound management decisions. ABR remains committed to the goals of providing timely, accurate, and cost-effective information to those who develop or manage our natural resources (see attached Statement of Qualifications).

R. H. Day

Robert H. Day, Project Leader/Principal Investigator
ABR, Inc.
P.O. Box 80410
Fairbanks, AK 99708-0410
907-455-6777

4/29/95

Date prepared

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Wiens, J. A. In press. Recovery of seabirds following the *Exxon Valdez* oil spill: an overview. In P. G. Wells, J. N. Butler, and J. S. Hughes, editors. *Exxon Valdez* oil spill: fate and effects in Alaskan waters. Special Technical Publication 1219, American Society of Testing and Materials, Philadelphia, Pennsylvania, USA.

Wiens, J. A., T. O. Crist, R. H. Day, S. M. Murphy, and G. D. Hayward. In review. Effects of the *Exxon Valdez* oil spill on marine bird communities in Prince William Sound, Alaska. Ecological Applications.

COST PROPOSAL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996
Personnel		$85.3
Travel		$3.7
Contractual		$58.0
Commodities		$3.1
Equipment		$0.0
Subtotal	$0.0	$150.1
USFWS Program Manager		$5.5
USFWS General Admin	$0.0	$10.3
Project Total		**$165.9**
Total Personnel Hours *		1,468
Other Resources		

LONG RANGE FUNDING REQUIREMENTS

Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
N/A	N/A	N/A	N/A	N/A	N/A

Dollar amounts are shown in thousands of dollars.

Comments:

ABR,Inc. has used **Hourly Rates** instead of Monthly Costs. The hourly rate shown is an all inclusive rate. ABR, Inc. requested permission from EVOS Trustee Council and received verbal permission on April 28, 1995 from **Sandra Schubert** to substitute all inclusive hourly rates for monthly costs and indirect costs.

• This revised budget only reflects 1996 expenditures; long range funding requirements will need to be recalculated based on results of 1996 program.

* Full-Time Equivalents (FTE) have been changed to Total Personnel hours.

1996

Project Number: 96142
Project Title: **Status and Ecology of Kittlitz's Murrelet in Prince William Sound**
Name: **ABR, Inc.**

FORM 4A
Non-Trustee
DETAIL

Prepared:

7/12/95
Revised

1996 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs: Name		Position Description		* Hours Budgeted	* Hourly Costs	Overtime	Proposed FFY 1996
Ritchie	R	Principal		8.0	$84	$0	0.7
Murphy	S	Research Coordinator		28.0	$79	$0	2.2
Day	R	Senior Scientist		686.0	$68	$0	46.6
DeLong	T	Office/Contracts Manager		20.0	$58	$0	1.2
Anderson	B	Senior Research Biologist I		40.0	$60	$0	2.4
Smith	M	GIS Specialist		24.0	$53	$0	1.3
Staff		Research Biologist II		510.0	$48	$0	24.5
Zusi-Cobb	A	Graphic Technician/GIS		96.0	$47	$0	4.5
Staff		Technician Aide		8.0	$26	$0	0.2
Staff		Admin. Asst		48.0	$35	$0	1.7
		Subtotal		1468.0	N/A	0	
						Personnel Total	$85.3

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Proposed FFY 1996
Commercial Air Travel (Fairbanks-Anchorage) in support of field work	418	6	6	125	3.3
Ground Transportation (Anchorage- Whittier)	100	4	4	0	0.4
				Travel Total	$3.7

1996

Project Number: 96142
Project Title: **Status and Ecology of Kittlitz's Murrelet in Prince William Sound**
Name: **ABR, Inc.**

FORM 4B
Personnel
& Travel
DETAIL

7/12/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:		Proposed
Description		FFY 1996
1 Boat Charter for 18 days @ $1,500/day (includes food and water and skiff)	Late May-Early June Cruise	27.0
2 Boat Charter for 18 days @ $1,500/day (includes food and water and skiff)	Late July -Early August Cruise	27.0
4 35 mm Camera Rental (4 weeks @ $50/week)-ABR Equipment Lease		0.2
5 Electronic Scale (2 weeks @ $100/week)-ABR Equipment Lease		0.2
6 Dissecting Scope (2 weeks at $100 Week)-ABR Equipment Lease		0.2
7 Phone/Fax/Modem		0.2
8 Photocopying		0.2
9 Report Printing		0.3
10 Fee (5%) on Contractual Costs (excluding ABR Equipment Lease)		2.7
	Contractual Total	$58.0

Commodities Costs:		Proposed
Description		FFY 1996
1 Gasoline for skiff		0.4
2 Misc Gear and Supplies		2.5
3 120 sampling bottles		0.1
4 60 litres of isopropyl alcohol		0.1
	Commodities Total	$3.1

1996

Project Number: 96142
Project Title: **Status and Ecology of Kittlitz's Murrelet in Prince William Sound**
Name: **ABR, Inc.**

FORM 4B
Contractual & Commodities DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units
1 Dissecting Laboratory	1
2 Library reference books	
3 Computer Resources	
4 GIS/Digitizing Station (s)	2
5 Office Space	
6 Equipment Storage	

1996

Project Number: 96142
Project Title: **Status and Ecology of Kittlitz's Murrelet in Prince William Sound**
Name: **ABR, Inc**

FORM 4B
Equipment
DETAIL

7/12/95

RESUMES OF KEY PERSONNEL

RESUME

ROBERT H. DAY

SENIOR SCIENTIST

EXPERTISE: ORNITHOLOGY (BREEDING BIOLOGY, FEEDING ECOLOGY, PELAGIC DISTRIBUTION OF SEABIRDS, MIGRATION, SEABIRD-FISHERY INTERACTIONS), MARINE POLLUTION, BIOLOGICAL OCEANOGRAPHY.

EDUCATION: B.A., Environmental Sciences, 1974. Antioch College, Yellow Springs, OH.
M.S., Zoology, 1980. University of Alaska, Fairbanks, AK.
Ph.D., Oceanography, 1992. University of Alaska, Fairbanks, AK.

RESEARCH PROFILE: Bob has 20 years of research experience in Alaska and elsewhere, in both marine and terrestrial studies. He has conducted research on such diverse topics as: effects of the *Exxon Valdez* oil spill on birds and mammals; the quantitative distribution of tarballs, marine debris, plastic pollutants and seabirds in the North Pacific and Bering Sea with respect to oceanography; the mortality of seabirds in gillnets used by foreign fishing fleets; the distribution of mesopelagic fishes and squids in the North Pacific; reproductive and feeding biologies of seabirds in the Gulf of Alaska, Aleutian Islands, and Bering Sea; the biology of gulls in Kenai Fjords National Monument; the ingestion of plastic pollutants by seabirds; nocturnal migration of birds in the Midwest, using radar; and censuses of seabird, marine mammal, and raptor populations in the Shumagin and Aleutian islands. In addition he has assisted in research on the effects of weather patterns on sea ice in the Bering Sea; the effects of oil development on waterfowl in the Prudhoe Bay oilfields; and the effects of the Alyeska Pipeline terminal on intertidal and subtidal benthic communities and feeding of fishes, crabs, and shrimps in Port Valdez. He is currently involved as a Principal Investigator on two long-term monitoring programs: studying the effects of the *Exxon Valdez* oil spill on birds and mammals in Prince William Sound and on the Kenai Peninsula. In addition to his responsibilities as a research biologist, Bob serves as an assistant editor for ABR and assists in preparation of publications.

RESEARCH EXPERIENCE:

Co-Principal Investigator, Bird Migration Studies. Studying patterns of migration of birds through a windpower site in Tarifa, Spain, to determine patterns of movement with respect to weather conditions. The information generated will be used to design a set of operational procedures for the windpower company to follow, so that it can minimize bird collisions with wind turbines.

Principal Investigator, Spectacled Eider Studies. Studying the distribution, abundance, and habitat use of this endangered species on 10 Long-range Radar Sites (formerly DEW-line sites) in northwestern and northern Alaska.

Co-Principal Investigator, Oilspill Studies. Studying the impacts to and recovery of wildlife from effects of the *Exxon Valdez* oil spill. Studies were on a diverse suite of birds and mammals and were conducted in Prince William Sound and on the Kenai Peninsula (1989-1994).

Principal Investigator, OTH-B (Over-The-Horizon, Backscatter) Radar Avian Studies. Studying the nocturnal migration of birds with respect to weather conditions near potential OTH-B radar sites in South Dakota and Minnesota (1989).

Co-principal Investigator, Marine Pollution Studies. Studied the quantitative distribution of tarballs, marine debris, and plastic pollutants in the Gulf of Alaska, North Pacific, and Bering Sea with respect to oceanography. Studied the decomposition of plastic debris at sea and its ingestion by and entanglement of seabirds, marine mammals, fishes, and squids (1976-1980, 1984-1989).

Principal Investigator, Studies of Seabirds at Sea. Studied the quantitative distribution, behavior, and migrations of seabirds in relation to oceanographic parameters, including extensive pelagic surveys in the Gulf of Alaska, North Pacific, and Bering Sea aboard NSF, NOAA, and foreign research vessels (1982-1988).

Principal Investigator, Seabird-Gillnet Studies. Studied the species composition, behavior, numbers, and mortality rates of seabirds killed in drift gillnets fished for squid and salmon in the North Pacific by Japanese, Korean, and Taiwanese fishermen (1982-1987).

Principal Investigator, Flying Squid Fishery Studies. Studied the oceanography; the species composition and abundance of zooplankton; the species composition and vertical distribution of mesopelagic fishes and squids that are eaten by Dall's Porpoises; and the quantitative distribution of seabirds and marine mammals in the North Pacific flying squid fishery (1987-1988).

Research Associate, Sea Ice-Atmospheric Studies. Worked with Dr. Joseph Niebauer of the University of Alaska on computer time-series analyses of oceanographic and atmospheric data sets, to determine the importance of several variables in affecting interannual patterns of sea ice, sea-surface temperatures, and air temperatures in the Bering Sea (1987).

Principal Investigator/Research Associate, Seabird Biology Studies. Studied the feeding biology of several species of seabirds; the nesting biology, nest-site characteristics, and reproductive performance of seabirds; and techniques for conducting seabird censuses at several locations in the Shumagin and Aleutian islands and Bering Sea (1975-1978, 1980-1983).

Research Assistant, Port Valdez Environmental Studies. Assisted Dr. Howard Feder of the University of Alaska with studies on the effects of discharge and tanker operations on the biology, species composition, feeding, and survivorship of intertidal and subtidal benthic invertebrates in Port Valdez. Also assisted with studies on species composition and distribution of benthic invertebrate communities for OCS offshore oil studies in the Bering Sea (1980-1983).

Research Associate, Gull Studies. Studied the effects of food and habitat characteristics on the reproductive performance of Glaucous-winged Gulls in Kenai Fjords National Monument. Also, conducted censuses of other seabirds and assisted with studies on ice-inhabiting Harbor Seals (1979).

Principal Investigator, Aleutian and Shumagin islands Wildlife Studies. Mapped and conducted censuses of seabird, marine mammal, and raptor colonies and populations in the central and western Aleutian Islands National Wildlife Refuge (1977-1978) and the Shumagin Islands Unit of the Alaska Maritime National Wildlife Refuge (1976).

Research Assistant, Puffin Studies. Assisted with research on breeding biology and feeding ecology of puffins in the western Aleutian Islands (1975).

EMPLOYMENT HISTORY:

ALASKA BIOLOGICAL RESEARCH, INC. Senior Scientist, 1989-present. Research Associate, 1986-1988 (part-time).

U.S. FISH AND WILDLIFE SERVICE, OFFICE OF MIGRATORY BIRDS, Washington, DC. Research Consultant, 1988.

N.O.A.A., NATIONAL MARINE FISHERIES SERVICE, Auke Bay Laboratory, Juneau, AK. Research Consultant, 1986-1988 (intermittent contracts).

JOINT INSTITUTE OF MARINE AND ATMOSPHERIC RESEARCH, UNIVERSITY OF HAWAII, Honolulu, HI. Research Consultant, 1988.

N.O.A.A., NATIONAL MARINE FISHERIES SERVICE, NATIONAL MARINE MAMMAL LABORATORY, Seattle, WA. Chief Scientist/Research Consultant, 1987-1988.

INSTITUTE OF MARINE SCIENCES, UNIVERSITY OF ALASKA, Fairbanks, AK. Graduate Research Assistant, 1983-1988 (part-time). Research Assistant/Research Associate, 1980-1983.

ALASKA PARKS STUDIES UNIT, UNIVERSITY OF ALASKA, Fairbanks, AK. Research Associate, 1979.

U.S. FISH AND WILDLIFE SERVICE, ALEUTIAN ISLANDS NATIONAL WILDLIFE REFUGE, ADAK, AK. Research Associate, 1977-1978. Research Assistant, 1975.

U.S. FISH AND WILDLIFE SERVICE, OFFICE OF BIOLOGICAL SERVICES, Anchorage, AK. Research Associate, 1976.

DIVISION OF LIFE SCIENCES, UNIVERSITY OF ALASKA, Fairbanks, AK. Teaching Assistant, 1983, 1976-1979.

PUBLICATIONS:

Day, R. H., S. M. Murphy, J. A. Wiens, G. D. Hayward, E. J. Harner, and L. N. Smith. In press. Use of oil-affected habitats by birds after the *Exxon Valdez* oil spill. Pages XXX-XXX *in* P. G. Wells, J. N. Butler, and J. S. Hughes, eds. *Exxon Valdez* oil spill: environmental impact and recovery assessment. Special Technical Publication 1219, American Society for Testing and Materials, Philadelphia, PA.

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PROFESSIONAL MEMBERSHIPS:

African Seabird Group
American Ornithologists' Union (Life Member)
Association of Field Ornithologists (Life Member)
British Ornithologists' Union (Life Member)
Colonial Waterbird Group (Life Member)
Cooper Ornithological Society (Life Member)
Ornithological Society of New Zealand
Pacific Seabird Group (Life Member)
Royal Australasian Ornithologists' Union
Sigma Xi, the Scientific Research Society
Society of Western Field Ornithologists (Life Member)
Wilson Ornithological Society (Life Member)

HONORS/ACHIEVEMENTS/PUBLIC SERVICE:

1994	Listed in *Dictionary of International Biography* (23rd ed.)
1993-present	Named to Endangered Species Recovery Team for Spectacled Eiders by U.S. Fish and Wildlife Service, AK.
1993	Listed in *Who's Who in the West* (24th ed.)
1993	Co-chair of Local Committee for 111th Annual Meeting of the AOU, Fairbanks, AK.
1988-1989	Board of Directors of Alaska Chapter Sigma Xi, the Scientific Research Society
1987-1988	Resource Fellow, University of Alaska, Fairbanks, AK.
1987	Sea Grant Fellow, University of Alaska, Fairbanks, AK.
1987	Listed in *Who's Who in American Universities and Colleges.*
1985-1986	Angus Gavin Memorial Fellow, University of Alaska, Fairbanks, AK.
1980	Most Outstanding Student in Biological Sciences, University of Alaska, Fairbanks, AK.
1970-1974	Alfred P. Sloan Scholar, Antioch College, Yellow Springs, OH.

96143-BAA

RECOVERY OF BIRD AND MAMMAL POPULATIONS IN PRINCE WILLIAM SOUND AFTER THE *EXXON VALDEZ* OIL SPILL

EXXON VALDEZ RESTORATION PROJECT PROPOSAL
Broad Agency Announcement (50ABF500082)

Prepared for:

Exxon Valdez Oil Spill Trustees Council
Anchorage Restoration Office
645 G. St, Suite 401
Anchorage, AK 99501

By:

ABR, Inc.
P.O. Box 80410
Fairbanks, AK 99708

29 April 1995

RECOVERY OF BIRD AND MAMMAL POPULATIONS IN PRINCE WILLIAM SOUND AFTER THE *EXXON VALDEZ* OIL SPILL

Submitted Under the BAA

Project Number:	96143-BAA
Restoration Category:	Research and Monitoring
Proposer:	ABR, Inc.
Lead Trustee Agency:	
Duration:	Four Years
Cost FY 96:	$321,200
Cost FY 97:	$452,400
Cost FY 98:	$474,900
Cost FY 99:	$139,700
Geographic Area:	Prince William Sound
Injured Resource:	Birds and Mammals

ABSTRACT

This study will assess the status of recovery of bird and mammal populations injured in the aftermath of the *Exxon Valdez* Oil Spill and is an extension of a study conducted in Prince William Sound in 1989–1991. We propose to conduct three surveys each year during 1996–1998 in nearshore and offshore habitats and will assess recovery based on wildlife use of oil-affected habitats and population status relative to prespill levels.

INTRODUCTION

The wreck of the *Exxon Valdez* in March 1989 released a large amount of oil that has had a substantial impact on the populations of birds and mammals that use Prince William Sound (PWS) and the northern Gulf of Alaska. Birds and mammals were among the most conspicuous victims of the *Exxon Valdez* Oil Spill (EVOS): >30,000 bird (Piatt et al. 1990) and >1,000 mammal carcasses (Loughlin 1994) were retrieved after the spill, and mortality estimates based on models projected substantially higher death tolls. In addition to these population losses, habitats used by marine-oriented wildlife were contaminated with oil or damaged by cleanup processes. Habitat degradation and continued exposure to oil potentially can retard recovery and result in sublethal effects, such as reproductive failure. Thus, the EVOS potentially affected marine birds and mammals along three primary pathways: effects on population size and structure, effects on habitat occupancy and use, and effects on reproduction (Wiens, in press).

In 1989-1991, we conducted 11 research cruises in PWS and 4 along the Kenai Peninsula to assess the effects of the spill on wildlife populations. Specifically, this research evaluated the effects of the EVOS on use of oil-affected habitats by marine birds and mammals, the status of summer populations of birds relative to pre-spill populations surveyed in 1984 and 1985 by Irons et al. (1988), and the effects of the spill on the distribution, abundance, and species composition of the overall bird community. Although we found that >20 species were negatively affected in 1989, all but 6 species were recovering by 1991

(Day et al., in press). This study will clarify the status of recovery for these six species and the species listed as unrecovered by the EVOS Trustee Council (Trustees).

We propose here to conduct three cruises each year during 1996–1998 in a long-term study of the distribution, species-composition, and population status of birds and mammals in PWS. The focus of this long-term study will be to compare use by birds and mammals of areas having been exposed to various levels of oiling and on changes in use that occur through time. These data will be useful for further defining the extent of impacts, for documenting recovery from spill effects, and for evaluating the population status of a wide variety of birds and mammals.

NEED FOR THE PROJECT

A. Statement of Problem

As of 1995, the Trustees has listed nine species of birds and mammals as injured by the spill, of which five are listed as unrecovered and two are listed as recovering. In our study conducted in PWS from 1989 to 1991, we found that >50% of the 42 species of birds that we evaluated were negatively impacted in 1989 with respect to their use of oil-affected habitats, but that all but 6 species showed signs of recovery by summer 1991 (Day et al., in press). We also identified three species that showed persistent population declines in 1989–1991 relative to prespill levels (Day et al., in press; Murphy et al., in prep). At the community level, birds showed avoidance of heavily oiled bays in 1989 and early 1991 and species diversity was adversely affected, but both of these effects disappeared by late summer 1991 (Wiens et al., in review).

In the context of birds and mammals injured by the oil spill, we can ask specific questions regarding recovery and restoration of wildlife resources in PWS:

1) Have wildlife populations recovered from the spill from a demographic perspective?
2) Are wildlife populations using spill-affected habitats at pre-spill levels or at levels commensurate with reference areas?
3) Has the bird community recovered with respect to measures of abundance, distribution, diversity, and dominance?
4) Has reproductive output been adversely affected by changes in demography, habitat degradation, or by sublethal effects of exposure to oil?

This research plan will address the first three of these questions in detail and will provide limited data on the fourth question for a limited number of species.

B. Rationale

Much of the research conducted in the aftermath of the spill was designed to document impacts and injury, with less attention given to evaluating recovery. The study we implemented in 1989 was designed specifically to document recovery over time. For example, during our three years of study in PWS, we were able to demonstrate that the percentage of bird species impacted in terms of use of spill-affected habitats decreased from 54% of the species analyzed on the first cruise in early summer 1989 to 10% of the species analyzed on the last cruise in mid-summer 1991 ($n = 47$ species). The validity of our analytical approach for documenting both impacts and recovery is perhaps best exemplified by the fact that we documented negative impacts to >20 species of birds in 1989 (Day et al., in press), whereas comparable surveys using different analytical techniques documented no species as

impacted in 1989 (Klosiewski and Laing 1994).

Recovery objectives for wildlife species listed as unrecovered vary from species to species but, in general, recovery is defined by the Trustees as having occurred when "their populations and productivity return to prespill levels or, in the absence of reliable prespill data, when there are no differences in these parameters between oiled and unoiled areas." Our proposed research program makes maximum use of prespill survey data, but is not constrained by a lack of prespill data because most hypotheses and related analyses are based solely on postspill data.

We propose to conduct this monitoring program for three years (1996–1998). When we designed the research program implemented in 1989, we aspired to a 10-year time line (1989–1998) from which to base definitive conclusions about the short- and long-term effects of the spill and the subsequent recovery of wildlife populations. Three more years of data would give us six years total, which we think would be an invaluable addition to understanding recovery and the extent of long-term impacts to wildlife in PWS. Three consecutive years of surveys are required primarily because we must account for natural year-to-year variation before we can evaluate oiling effects.

With data collected from this proposed study in combination with the data from our previous research, we will be able to quantitatively assess the status of recovery with respect to use of spill-affected habitats in PWS of all of the wildlife species (except Killer Whale) listed as unrecovered by the Trustees (Common Murre, Harlequin Duck, Marbled Murrelet, Pigeon Guillemot, harbor seal, and sea otter), as well as the recovering species (Bald Eagle and Black Oystercatcher) and those additional species identified in our prior research as unrecovered as of 1991 (Red-necked Grebe, Horned Grebe, Barrow's Goldeneye, Bufflehead, Mew Gull, and Northwestern Crow with respect to habitat use, and Red-necked Grebe, Pelagic Cormorant, and Pigeon Guillemot with respect to prespill populations [Day et al, in review, Murphy et al., in prep.]). In addition, we will assess the status of river otters and Steller's sea lions and at least 25 other bird species and will analyze impacts and recovery to the overall bird community.

C. Summary of Major Hypotheses and Objectives

The primary goals of this study are to monitor bird and mammal populations in PWS and to evaluate the status of these species with respect to injuries from the EVOS, particularly those species that are designated as unrecovered. We will address these goals by measuring the abundance of numerous species of marine-oriented birds and mammals at sites that were exposed to different initial levels of oiling and by following patterns of occupancy of these sites through time. To accomplish these goals, we have identified the following objectives:

1. to survey birds and mammals using offshore, nearshore, intertidal, supratidal habitats in a series of bays in PWS that were subjected to various degrees of oiling;
2. to examine effects of the oil spill on birds and mammals by comparing use by birds and mammals among bays that were exposed to various levels of oiling and relating differences in use to the degree of oiling and habitat features of the bays;
3. to evaluate recovery of bird and mammal populations inhabiting these bays by comparing use through time (1989–1991, 1996–1998);
4. to compare the abundance of bird and mammal populations with prespill data to determine if there have been significant changes in populations since the spill (1984/85 vs. 1996–1998); and
5. to examine the status of the overall bird community with respect to use of oil-affected habitats and how that has changed since the spill.

Based on these objectives, we can state a series of hypotheses that will be addressed quantitatively.

1. H_o1: Wildlife populations are occupying bays in PWS at levels that are independent of the amount of oil that the bays were exposed to in 1989.
2. H_o2: Annual changes in the density of wildlife populations are not related to the amount of oil that the bays were exposed to in 1989.
3. H_o3: Densities of wildlife populations in the various study bays do not differ between prespill (1984/85) and postspill surveys (1996–1998).
4. H_o4: Various measures of the status of the overall bird community (e.g., species diversity) do not differ between oiled and unoiled habitats.
5. H_o5: The spill did not differentially affect various ecological guilds of bird species.

To test these hypotheses we will employ a series of sophisticated analytical techniques that have proven to be powerful for detecting both impacts and recovery (Day et al., in press). In addition, we will use the three years (1989–1991) of data collected and analyzed using identical techniques to those proposed here, to provide a time series that will enable us to make definitive conclusions on the status of recovery of 40–50 species of birds and mammals.

D. Completion Date

We propose to conduct field research during 1996–1998. Annual reports will prepared after the 1996 and 1997 field seasons and a final report will be prepared in 1999. We anticipate that the restoration objectives for a variety of species may be met and reported on prior to the completion of the report, but that the overall synthesis of recovery status of the various species will not be completed until 1999.

COMMUNITY INVOLVEMENT

Opportunities for community involvement in this project include:

1. chartering boats from PWS residents (approx. 30% of proposed budget);
2. hiring PWS residents as technicians provided they meet qualifications;
3. Principal Investigators will be available to present highlights of the research program to PWS communities; and
4. Principal Investigators will write an article for the Trustees newsletter each year during the life of the project.

FY 96 BUDGET

Personnel	162.0
Travel	4.2
Contractual	151.2
Commodities	3.8
Equipment	0
Subtotal	321.2
Indirect Costs	0
Total	321.2

PROJECT DESIGN

A. Objectives

The primary goals of this study are to monitor bird and mammal populations in PWS and to evaluate the status of these species with respect to injuries from the EVOS, particularly those species that are designated as unrecovered. We will address these goals by measuring the abundance of numerous species of marine-oriented birds and mammals at sites that were exposed to different initial levels of oiling and by following patterns of occupancy of these sites through time. To accomplish these goals, we have identified the following objectives:

1. to survey birds and mammals using offshore, nearshore, intertidal, supratidal habitats in a series of bays in PWS that were subjected to various degrees of oiling;
2. to examine effects of the oil spill on birds and mammals by comparing use by birds and mammals among bays that were exposed to various levels of oiling and relating differences in use to the degree of oiling and physical and biological features of the bays;
3. to evaluate recovery of bird and mammal populations inhabiting these bays by comparing use through time (1989–1991, 1996–1998);
4. to compare the abundance of bird and mammal populations with prespill data to determine if there have been significant reductions in populations since the spill (1984/85 vs. 1996–1999); and
5. to examine the status of the overall bird community with respect to use of oil-affected habitats and how that has changed since the spill.

B. Methods

Data Collection—This field study will involve using two sampling techniques: nearshore and offshore surveys. These surveys are identical in method to those used in our PWS and Kenai Peninsula wildlife recovery studies conducted in 1989–1991 (Day et al., in press). Three replicate surveys will be conducted in each of the 10 bays during each cruise. We propose to sample in late winter during the time of year when the spill occurred, during early summer when breeding populations are at their peak, and during late summer when young-of-the-year are present and can be identified.

Nearshore surveys will be used to count and locate all waterbirds, waterfowl, shorebirds, seabirds, and terrestrial birds and terrestrial and marine mammals that are using supratidal, intertidal, and nearshore habitats. We will follow procedures that we previously used for counting nearshore and shoreline birds in PWS and along the Kenai and which follow procedures used by the USFWS prior to the spill (Irons et al. 1988). In each bay, small boats will be driven slowly along the shoreline at about 50 m from the beach, and all birds and mammals seen on the water within 200 m of the shoreline (nearshore zone), on the beach (intertidal zone), and on the shore within 100 m of the high-tide mark (supratidal zone; used primarily by eagles and corvids) will be identified and counted. Birds that fly over these three zones will be counted separately. Care will be taken to avoid double-counting. Most of these animals, particularly waterbirds, seaducks, otters, and seals, occur within 200 m of the shoreline or only on the shoreline. Data recorded for all birds and mammals seen on the water or shoreline will include species, number, age (if known), sex (if known), and location (e.g., flying, supratidal, intertidal, nearshore). Other information will be recorded as notes in comments.

Offshore surveys will sample birds that occur in the centers of bays (>200 m from shore) and in waters off the mouths of bays. This sampling technique approximates one developed on Kodiak Island by the

USFWS (Forsell and Gould 1981). In each bay, the ship will follow a predetermined survey trackline, and we will identify and count all birds seen within 150 m of each side of the ship when it is within the bay and within 300 m of one side of the ship when it is off the mouth of the bay. In each bay, the ship will follow a predetermined trackline, and observers will identify and count birds and mammals seen within 150 m of each side of the ship when it is within a bay and within 300 m of one side of the ship when it is outside of a bay. Data collected will include: species, number, age (if known), sex (if known), and behavior/habitat (e.g., flying, on the water, swimming, feeding). Other information will be recorded as notes in comments.

Data Management—Before and during each cruise, we will ensure quality control in data collection and handling. To minimize among-cruise effects of inter-observer variation in bird identification and distance estimation abilities, we will conduct training sessions before each cruise, use a core of highly trained observers who will participate in each cruise, will constantly check for agreement among observers, and will have each team of observers sample all bays. After our return from a cruise, copies of the completed data forms will be stored separately, to ensure that there are two copies of the data at all times. The data are keypunched into Excel files on ABR's computer system. After the data are keypunched, the files will be proof-read for accuracy, corrected, and re-proofed. For long-term archival of data, copies of keypunched data will be stored in a safety deposit box.

Data Analysis—We will develop three data sets for hypothesis testing: nearshore, offshore, and combined data sets. Data for all three sets will be summarized by species, bay, and cruise. The nearshore data set will be standardized as estimates of birds/km of shoreline and mammals/km of shoreline. The offshore data set will be standardized as densities of birds and mammals by dividing the total count for a species by the total area sampled (trackline length x width) during each bay-visit. The combined data set incorporates both the nearshore and offshore surveys to produce a single count for each species for an entire bay.

We propose to use an oiling index we developed that reflected the initial oiling exposure for each bay (Day et al., in press). Data used in calculating this index were mapped in the field in 1989 by shoreline surveys and consisted of five possible categories for each uniformly oiled stretch of shoreline (Neff et al., in press): no oil, very light oil ($\leq$10% of the shoreline had spots of oil), light oil (band of oil <3 m wide), moderate oil (band 3 to 6 m wide), and heavy oil (band >6 m wide). For each bay, we calculated the percentage of the total shoreline length in each oiling category, then multiplied these percentages by a weighting factor for each category (from 0 for no oil to 4 for heavy oil) and summed the products to obtain an oiling-index value. For example, a bay with light oil along 44.5% of its shoreline and moderate oil along 55.5% would have an oiling index of 255.5 [(44.5 x weighting factor of 2 for light oil) + (55.5 x weighting factor of 3 for moderate oil)]. Oiling-index values could range from 0 (100% no oil x weighting factor of 0 for no oil) to 400 (100% heavy oil x weighting factor of 4 for heavy oil). Actual index values calculated for bays sampled in PWS ranged from 0 to 288.2. Although most of the surface oil was gone from bays and shorelines after 1989, we retained the oiling index to evaluate impacts and recovery in 1990 and 1991 and propose to use it in 1996–1998 as well.

We also propose to use the habitat characteristics of each bay that were measured in 1989–1991 (Day et al., in press) to describe other physical and biological characteristics of bays that may have affected the distribution or abundance of birds. These measurements were treated as fixed values over all cruises. Physical features that were measured with computers from digital maps included bay area, numbers of islands/km of shoreline, numbers of islets and intertidal rocks/km of shoreline, shoreline complexity (fractal dimension--see Pennycuick and Kline 1986), and overall shallowness (percentage of the bay area

within 200 m of shore that was ≤ 18 m deep). We also conducted surveys to determine the percentage of shoreline having each of four substrates (bedrock, bedrock/rubble, boulder/cobble, and pebble/gravel), each of three supratidal slope characteristics (0-30°, 31-60°, 61-90°), and special habitat features (e.g., cliffs). Biological features measured and mapped during these surveys included the percentage of shoreline having mussel (*Mytilus* spp.), fucus (*Fucus* spp.), bullwhip kelp (*Nereocystis lutkeana*), and seagrass (*Zostera marina* and *Phyllospadix scouleri*) beds and the percentage of shoreline bounded by each of nine types of supratidal vegetation (e.g., coniferous forest, shrubs). These vegetation types represent a hybrid classification system derived from Kessel (1979) and Viereck et al. (1986). In addition, we used historical data from the Alaska Department of Fish and Game (primarily from ADFG [1978]) and from our surveys to determine the number of salmon (*Oncorhynchus* spp.) runs/km of shoreline in each bay.

We propose to use the same set of analyses used in 1989–1991 to assess impacts and recovery (Day et al., in press; Murphy et al., in prep.; Wiens et al., in review) to analyze data collected in 1996–1998. In addition, we will use the three years (1989–1991) of data collected using identical techniques to those proposed here, to provide a time series that will enable us to make definitive conclusions on the impacts to and recovery of 40–50 species of birds and mammals.

Specifically, we will use data from nearshore and offshore surveys to develop regression models that relate the abundance of a species (dependent variable) to initial oiling levels (i.e., oiling index, the primary independent variable) and habitat variables (secondary independent variables). Three types of models will be developed: oiling models and oiling + habitat models both tested for oiling effects within a particular year, whereas among-year models compared oiling effects during the same season in subsequent years. The combined data set will be used to examine the status of recovery for the overall bird community.

The oiling and the oiling + habitat models will examine the effects of oiling for each cruise separately within a particular year. These analyses will provide the primary evidence for the persistence of impacts and will be used to address Hypothesis 1 (H_o1: Wildlife population are occupying bays in PWS at levels that are independent of the amount of oil that the bays were exposed to in 1989). The oiling models will measure the effects of oiling on abundance of birds and mammals through simple regressions of density or counts versus oiling. Oiling + habitat models will evaluate the effects of oiling after the effects of habitat variation among bays have been accounted for. To do these analyses, we first will identify significant habitat variables for a data set. We then will build habitat models from these variables, calculate the residuals from these models of densities or counts versus habitat variables, and regress these residuals against oiling to determine the relationship between abundance and oiling after the effects of habitat have been removed. Recovery is indicated by the absence of an impact that had been detected on earlier cruises in the oiling + habitat analyses.

Among-year analyses will provide the primary evidence of recovery for individual species and will be used to address Hypothesis 2: (H_o2: Annual changes in wildlife populations are not related to the amount of oil that the bays were exposed to in 1989). Among-year models are extensions of the oiling models that allow for year effects and oil-by-year interactions. Such an approach is necessary because bird and mammal abundances at the same season can vary among years, either independently or as a function of oiling. A year effect would reflect a similar change in abundance across all bays among years, regardless of oiling level, but an oil-by-year interaction would reflect a change in effects of oiling among years. Recovery is indicated by significant oil-by-year interactions that yielded increasingly positive regression slopes (i.e., increased use of heavily oiled bays).

To increase the likelihood of detecting oiling effects in these statistical analyses, we will use α levels up to 0.20 because the combination of high variance and small sample sizes in some data sets reduces the power to detect an oiling effect. In addition, some analyses involve multiple tests for a species over time. The broader zone of "significance" provided by a less stringent α level enables us to detect trends over successive cruises that probably would be missed if we restricted our attention to the traditional α level of 0.05. Because we will be using the test results from several different statistical procedures to evaluate the status of each species, we can not calculate the joint power, or joint significance level, for all analyses combined.

We will conduct before–after comparisons (Murphy et al., in prep.; Wiens and Parker, in press) to examine Hypothesis 3 (H_o3: Densities of wildlife populations in the various study bays do not differ between prespill (1984/85) and postspill surveys (1996–1998). We will average density estimates from our multiple visits to a bay in the same year to calculate the mean densities that will be used to compare with Irons et al. (1988), who visited each bay only once in 1984 or 1985. We will use a one-sample *t*-test (Zar 1984:97) to evaluate whether there was a mean change in density for a species over all bays between a given postspill year and the prespill baseline. We will consider the overall abundance of a species to have changed if the mean change in densities is significantly different than zero. We will use a large α (0.20) for hypothesis testing to increase statistical power, which also will increase the probability of detecting oiling effects that did not really occur (i.e. Type I errors). We will conduct power analyses on the results of these analyses to assesses the probability of Type II errors and, hence, our ability to detect impacts. Power will be calculated by the procedures described in Winer et al. (1991:120–138). Power will be computed with $\alpha = 0.20$, the same as that used for statistical tests. Results will be classified as high power (≥90% chance of detecting a two-fold change), moderate power (≥60% and <90%), and low power (<60%). Recovery will be evaluated for all species that showed initial (1989) negative impacts by examining the trends in densities and statistics in 1990–1991 and 1996–1998.

We will examine several measures to evaluate the status of the bird community with respect to use of spill-affected habitats. Species diversity will be measured as species richness and log-series α, which is a parameter that incorporates both species richness and eveness (Magurran 1988). We will use randomization techniques (Solow 1993) to evaluate these measures of species diversity for Hypothesis 4 (H_o4: Various measures of the status of the overall bird community (e.g., species diversity) do not differ between oiled and unoiled habitats).

We will analyze the relationship between bird distribution and abundance across al bays using correspondence analysis (Wiens et al., in review). Correspondence analysis is an indirect gradient analysis technique that ordinates species distributions along environmental gradients using reciprocal averaging of species scores and site scores. We will use Program CANOCO (ter Braak 1986, 1987) to test Hypothesis 4 with respect to the status of distribution and abundance of the bird community as it relates to oiling.

We will examine the relationship between oiling and guild structure by first assigning each species to an ecological guild that reflects various aspects of the life history and ecology of the species (degree of residency in PWS, breeding aggregation, nest location, prey type, foraging method, and feeding zone). Guild assignments for the individual species were performed using clustering procedures (van Torgenen 1987) for the suite of species recorded in 1989–1991 (Wiens et al., in review). These analyses produced

four guilds for the bird community in PWS and we will rely on this classification for analyses of data collected for this study. Hypothesis 5 (H_o5: The spill did not differentially affect various ecological guilds of bird species), which examines the relationship between ecological guilds and oiling will be evaluated using Pearson correlations (Wiens et al., in press).

C. Contracts and Other Agency Assistance

With the exception of boat charters, all work will be conducted by ABR, Inc. We will charter two 50-80 ft boats for each cruise. We anticipate chartering these boats out of Valdez, Whittier, or Seward. There are several boats and captains that we have worked with in the past that we will attempt to contract with these individuals. We can not state with certainty at this time, however, who we will contract with.

D. Location

Field work for this project will be conducted in PWS. We propose to conduct surveys in 1996–1998 in the same ten bays sampled in 1989–1991. These bays are of similar habitat, in that they are fjords with coastlines consisting of mixtures of bedrock, boulders, cobbles, gravel, and sand primarily in the vicinity of Knight Island. The following bays have been selected:

1. Galena Bay: Large, unoiled bay on the mainland to the northeast of Bligh Reef.
2. Eshamy Bay: Large unoiled bay on the mainland to the west of Knight Island.
3. Lower Herring Bay: Unoiled bay on the western side of Knight Island.
4. Drier Bay: Large, unoiled bay on the western side of Knight Island.
5. Northwest Bay: Heavily-oiled bay on the northern side of Eleanor Island.
6. Herring Bay: Large, heavily-oiled bay on the northwestern side of Knight Island.
7. Bay of Isles: Large, moderately-oiled bay on the eastern side of Knight Island.
8. Snug Harbor: Moderately-oiled bay on the eastern side of Knight Island.
9. Hogan Bay: Moderately-oiled bay on the eastern side of Knight Island.
10. Shelter Bay: Moderately-oiled bay on the northern side of Evans Island.

The effect of this project on communities in PWS will be minimal. We will be using Valdez, Whittier, or Seward as a base of operation for our cruises, depending on the home port of the charter vessels. We anticipate using hotels and restaurants in these towns for 1–2 days during each cruise. We periodically will use local port facilities for refueling during our cruises.

SCHEDULE

A. Measurable Project Tasks for FY 96

Start-up to April 1996:	Arrange logistics (boats, equipment, etc.)
19 March–1 April 1996:	Conduct late-winter cruise
11 June–24 June 1996:	Conduct early-summer cruise
23 July–5 August 1996:	Conduct late-summer cruise
15 August–30 September 1996:	Data entry and management (QA/QC and archiving)
15 April 1997:	Annual report on FY 96 work

B. Project Milestones and Endpoints

19 March–1 April 1996:	Conduct late-winter cruise
11 June–24 June 1996:	Conduct early-summer cruise
23 July–5 August 1996:	Conduct late-summer cruise
30 September 1996:	Complete data entry and management (QA/QC and archiving)
1 October 1996–31 January 1997	Data Analysis
1 February–1 April 1997	Prepare 1996 Annual Report
15 April 1997	Submit 1996 Annual Report to Chief Scientist
19 March–1 April 1997:	Conduct late-winter cruise
11 June–24 June 1997:	Conduct early-summer cruise
23 July–5 August 1997:	Conduct late-summer cruise
30 September 1997:	Complete data entry and management (QA/QC and archiving)
1 October 1997–31 January 1998	Data Analysis
1 February–1 April 1998	Prepare 1997 Annual Report
15 April 1998	Submit 1997 Annual Report to Chief Scientist
19 March–1 April 1998:	Conduct late-winter cruise
11 June–24 June 1998:	Conduct early-summer cruise
23 July–5 August 1998:	Conduct late-summer cruise
30 September 1998:	Complete data entry and management (QA/QC and archiving)
1 October 1998–31 January 1999	Data Analysis
1 February–1 April 1999	Prepare Final Synthesis Report
15 April 1999	Submit Final Synthesis Report to Chief Scientist

Each of the projects objectives will be addressed during each year of the project. Objective 1 pertains to data collection and will be accomplished incrementally as each of the nine proposed cruises is conducted. Objectives 2–5 are analytical objectives that will be addressed in each of the two Annual Reports and in the Final Synthesis Report. The overall goals of the project—to monitor bird and mammal populations in PWS and to evaluate the status of these species with respect to injuries from the EVOS, particularly those species that are designated as unrecovered—also will be addressed in each of the two Annual Reports and in the Final Synthesis Report. We will report on the status of recovery of individual bird and mammal species and the overall bird community in the Annual Reports, but overall conclusions on the status of recovery will not be completed until we analyze all three years of data and prepare the Final Synthesis Report in 1999.

C. Project Reports

We will submit Annual Reports for the 1996 and 1997 field seasons. Each report will be submitted to the Chief Scientist no later than 15 April of the year following data collection and will cover data collected during that year. Those reports also will synthesize and compare results for that year and previous years. After the final year of data collection in 1998, we will submit a Final Report that will synthesize and compare results from all six years of the study (1989–1991 and 1996–1998). We also are interested in publishing the results of this research and will be receptive to any suggestions as to how that can be accomplished under the auspices of Restoration Program.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Although our study is not an integrated component of the Nearshore Vertebrate Predator Program or the Seabird Fish/Forage Program, the data that we collect on the various species that are being investigated by those programs will be of value to the these other investigators. Dr. Daniel Roby (University of Alaska Fairbanks) has indicated that the data we will be collecting on Pigeon Guillemots will be of great value to his research program. Indeed, all other wildlife studies will benefit from the population trend data that we will be able to provide.

With respect to shared logistics, we have not determined how we could use the resources of other studies. We may not be aware of all of the possibilities, however. We certainly are amenable to pursuing cost-saving alternatives to our proposed study plan and we would welcome the participation of other scientists on our research vessels, if practical.

At this time, we have no cofunding source for this project.

ENVIRONMENTAL COMPLIANCE

Because we will not be setting up camps or collecting animals, we do not anticipate needing any permits to conduct this research program.

PERSONNEL

Mr. Stephen M. Murphy will be a Co-Principal Investigator for this project. In the event that Dr. Day is funded to conduct research on Kittlitz's Murrelets for the Trustees, Mr. Murphy also will function as Project Leader for birds. Mr. Murphy has conducted research in Alaska since 1977 and has 15 years of experience designing research programs for assessing the effects of human activities on wildlife. He has studied coastal habitats in southcentral Alaska, shorebird migration and nesting ecology on the Copper River Delta, waterfowl ecology in interior Alaska, and the impacts of human disturbance on seabirds, waterfowl, shorebirds, raptors, marine mammals, and caribou in a variety of studies throughout the state. Most recently, he was the Co-principal Investigator for assessing the effects of the EVOS on birds and mammals in PWS and along the Kenai Peninsula for Exxon Company, USA. Mr. Murphy is a Research Associate at the Institute of Arctic Biology, University of Alaska Fairbanks (see attached resume).

Dr. Robert H. Day will be a Co-Principal Investigator and the Project Leader for birds for this project. Dr. Day has conducted research on seabirds, marine ecology, impacts of marine pollution, and marine conservation topics in Alaska for 20 years. Research topics have included the biology of seabirds in Alaska; the ingestion of plastic pollutants by seabirds in Alaska; the mortality of seabirds in the high-seas drift-gillnet fishery of the North Pacific; and the distribution abundance, and decomposition of plastic pollution and other marine debris in the North Pacific. Most recently, he was the Co-principal Investigator for research assessing the impacts of the EVOS on marine-oriented birds and on bird communities for Exxon Company, USA. (see attached resume).

Mr. Charles B. Johnson will be Project Leader for mammals. Mr. Johnson has been involved in field studies of Alaskan wildlife since 1980. His work has focused on research in habitat relationships, behavioral ecology, foraging ecology, and productivity of a variety of mammals, seabirds, and waterfowl. He has conducted research throughout the state including studies of the ecology of mink and river otters in southeast Alaska, brown bear–human interactions on Admiralty Island, walrus and seal

harvests on St. Lawrence Island, and seabird population studies on St. Matthew Island. Recently, Mr. Johnson was the Principal Investigator for studies of effects of the EVOS on habitat use by mink and river otters and on the status and recovery of sea otters and was a Project Leader for seabird studies in PWS for Exxon Company, USA. (see attached resume).

Mr. Murphy, Dr. Day, and Mr. Johnson all are employed by ABR, Inc. (formerly Alaska Biological Research, Inc.). ABR is an Alaskan-owned small business—headquartered in Fairbanks since its formation in 1976—that specializes in environmental research and services. During nearly two decades of operation in Alaska, ABR has served a variety of clients, including private industry, state and federal government agencies, and the University of Alaska. During this time, we have developed a reputation for conducting objective research that provides the basis for sound management decisions. ABR remains committed to the goals of providing timely, accurate, and cost-effective information to those who develop or manage our natural resources (see attached Statement of Qualifications).

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R. H. Day SM

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29 April 1995
Date prepared

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COST PROPOSAL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996						
Personnel		$162.0						
Travel		$4.2						
Contractual		$151.2						
Commodities		$3.8						
Equipment		$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$0.0	$321.2	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
Indirect		$0.0						
Project Total	$0.0	$321.2	$452.4	$474.9	$139.7			
Total Personnel Hours *		2,848						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

ABR,Inc. has used **Hourly Rates** instead of **Monthly Costs.** The hourly rate shown is an all inclusive rate. ABR, Inc. requested permission from EVOS Trustee Council and received verbal permission on April 28, 1995 from **Sandra Schubert** to substitute an all inclusive houlry rate for monthly costs and indirect costs.

Proposed FFY 1996 does not include data analysis and report writing of 1996 field work. Data analysis and report preparation costs **($110,000)** will appear in FFY 1997.

ABR, Inc. has added 5% escalation to each FFY budget after 1996.

* Full-Time Equivalents (FTE) have been changed to Total Personnel hours.

1996

Project Number:
Project Title: **Recovery of Bird & Mammal Populations in Prince William Sound After EVOS**
Name: **ABR, Inc.**

FORM 4A
Non-Trustee
DETAIL

Prepared:

4/29/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:				* Hours	* Hourly		Proposed
Name		Position Description		Budgeted	Costs	Overtime	FFY 1996
Ritchie	R	Principal		8.0	$84	$0	0.7
Murphy	S	Research Coordinator		354.0	$79	$0	28.0
Day	R	Senior Scientist		584.0	$68	$0	39.7
DeLong	T	Office/Contracts Manager		48.0	$58	$0	2.8
Johnson	C	Senior Research Biologist II		536.0	$63	$0	33.8
Anderson	B	Senior Research Biologist I		48.0	$60	$0	2.9
Smith	M	GIS Specialist		8.0	$53	$0	0.4
Staff		Research Biologist I		492.0	$46	$0	22.6
Staff		Research Biologist I		282.0	$46	$0	13.0
Staff		Technician III		164.0	$40	$0	6.6
Staff		Technician III		164.0	$40	$0	6.6
Staff		Administrative Assistant		80.0	$35	$0	2.8
Staff		Technicain Aide		80.0	$26	$0	2.1
			Subtotal	2848.0	N/A	0	
						Personnel Total	$162.0

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FFY 1996
Per Diem for Cruise participants, 1 night in Anchorage or Whittier (3 cruises)			14	125	1.8
Ground Transportation-Portage to Whittier (3 cruises)	400	6			2.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$4.2

1996

Project Number:
Project Title: **Recovery of Bird & Mammal Populations in Prince William Sound After EVOS**
Name: **ABR, Inc.**

FORM 4B
Personnel
& Travel
DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:		Proposed
Description		FFY 1996
1 Boat Charter, 2 Boats **(Winter)** out of Whittier for 14 days @ $1,800/day (includes food and water and skiff)	Late March -Early April	50.4
2 Boat Charter, 2 Boats **(Summer)** out of Whittier for 14 days @ $1,600/day (includes food and water and skiff)	Summer	44.8
3 Boat Charter, 2 Boats **(Summer)** out of Whittier for 14 days @ $1,600/day (includes food and water and skiff)	Summer	44.8
4 Truck Rental , Fairbanks-Portage for 4 to 6 people, 6 weeks @ $550/week (3 cruises)		3.3
5 Phone/Fax/Modem		0.2
6 Photocopying		0.2
7 Report Printing		0.3
8 Fee (5%) on Direct Costs		7.2
	Contractual Total	$151.2

Commodities Costs:	Proposed
Description	FFY 1996
1 Gasoline for skiff	0.8
2 Misc Gear and Supplies	3.0
Commodities Total	$3.8

1996

Project Number:
Project Title: **Recovery of Bird & Mammal Populations in Prince William Sound After EVOS**
Name: **ABR, Inc.**

FORM 4B
Contractual & Commodities DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	

1996

Project Number:
Project Title: **Recovery of Bird & Mammal Populations in Prince William Sound After EVOS**
Name: **ABR, Inc**

FORM 4B
Equipment
DETAIL

RESUMES OF KEY PERSONNEL

RESUME

STEPHEN M. MURPHY

RESEARCH COORDINATOR

EXPERTISE: PROJECT MANAGEMENT, RESEARCH DESIGN AND ANALYSIS, ORNITHOLOGY (WATERFOWL, SHOREBIRDS, SEABIRDS), MAMMALOGY (CARIBOU), ANIMAL BEHAVIOR, IMPACT ASSESSMENT

EDUCATION: B.S., Wildlife Biology, 1975. University of Rhode Island.

M.S., Wildlife Biology, 1981. University of Alaska Fairbanks.
Thesis Title: Habitat use by migrating and breeding shorebirds on the eastern Copper River delta, Alaska.

RESEARCH PROFILE: Steve has 18 years of professional experience in Alaska and his energy has been invested in a number of applied research projects, including behavioral and population studies of waterfowl, shorebirds, seabirds, and caribou. Steve's skills include development of field and analytical techniques for environmental baseline and impact assessment studies, design and evaluation of mitigative measures for development projects, project management, and an ability to work effectively with the private and public sectors to solve resource problems.

Since joining ABR in 1981, Steve has been a Field Project Leader and Principal Investigator on a number of research projects throughout the state. Steve became ABR's Research Coordinator in 1986, and in this capacity he is responsible for the technical quality all of research projects at ABR. Steve oversees a staff of senior scientists and coordinates research design, data management and analysis, and report and publication writing.

RESEARCH EXPERIENCE: Co-principal Investigator, **Assessment of the Effects of Low Level Jet Aircraft Disturbance of Peregrine Falcons in Alaska, U.S. Air Force.** A cooperative study with the University of Alaska to measure and model the and effects of subsonic aircraft disturbance on reproduction and behavior. (1994–present)

Co-Principal Investigator, **Oil Spill Studies.** Studying the recovery of wildlife from effects of the *Exxon Valdez* oil spill. Studies were on a diverse suite of birds and mammals and were conducted in Prince William Sound on the Kenai Peninsula. (1989–1991)

Principal Investigator, **Lisburne Terrestrial Monitoring Program, Prudhoe Bay.** Managed a five-year study designed to assess impacts of Lisburne oil development on geese and swans by monitoring behavior and population status. (1985–1993)

Co-principal Investigator, **Assessment of the Effects of Low Level Jet Aircraft Disturbance of Caribou in Alaska, U.S. Air Force.** A cooperative study with the University of Alaska to measure and model the behavioral and physiological effects of subsonic aircraft disturbance. (1988-present)

Field Project Leader, **Tundra Bird Studies, Kuparuk Oilfield.** Conducted censuses of tundra birds as part of revegetation and site evaluation studies (1985).

Field Project Leader, **Central Arctic Herd Caribou Studies,** Kuparuk Oilfield. Conducted four years of studies assessing impacts of oil development on caribou, monitoring caribou behavior crossing linear structures. Developed mitigation strategies to lessen impacts of development on caribou (1981-1984).

Research Associate, **Northwest Gas Pipeline Waterfowl and Wetlands Study,** Interior Alaska. Conducted field program for a study designed to assess waterfowl populations and to identify limnologic characteristics of important waterfowl habitats along proposed gas pipeline route (1979-1980).

Graduate Assistant, **Copper River Delta Shorebird Study.** Designed and conducted research on patterns of habitat use by migrating and breeding shorebirds (1978-1979).

Research Assistant, **Saltmarsh Habitat Study,** Southcentral Alaska. Assisted with floristic studies at 11 coastal wetlands in Gulf of Alaska, Prince William Sound, and Cook Inlet, and assessed wildlife values at each site (1977-1978).

EMPLOYMENT HISTORY:

ABR, INC., Fairbanks, **Research Coordinator,** May 1986 - present. **Senior Research Biologist,** May 1981 - May 1986.

UNIVERSITY OF ALASKA, FAIRBANKS, INSTITUTE OF ARCTIC BIOLOGY, **Research Associate,** December 1989 - present.

UNIVERSITY OF ALASKA MUSEUM, Fairbanks, **Research Biologist,** April 1979 - April 1980.

UNIVERSITY OF ALASKA, FAIRBANKS, COOPERATIVE WILDLIFE RESEARCH UNIT, **Graduate Assistant,** February 1978 - March 1979, July 1980 - May 1981.

UNIVERSITY OF ALASKA, FAIRBANKS, INSTITUTE OF ARCTIC BIOLOGY, **Research Assistant**, February 1977 - February 1978.

PUBLICATIONS:

Day. R. H. , S. M. Murphy, J. A. Wiens, G. C. Hayward, E. J. Harner, and L. N. Smith. In press. Use of oil-affected habitats by birds after the *Exxon Valdez* oil spill. 37 manuscript pages *in* P. G. Wells, J. N. Butler, and J. S. Hughes (eds.). The *Exxon Valdez* oil spill: environmental impact and recovery assessment. Special Tech. Publ. 1219, American Society of Testing and Materials, Philadelphia, Pennsylvania.

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Murphy, S. M., B. Kessel, and L. J. Vining. 1984. Waterfowl populations and limnologic characteristics of taiga ponds. J. Wildl. Manage. 48(4): 1156-1163.

Murphy, S. M. 1981. Habitat use by migrating and breeding shorebirds on the eastern Copper River delta, Alaska. M. S. Thesis, Univ. Alaska, Cooperative Wildl. Res. Unit. 81 pp.

Mickelson, P. G., S. M. Murphy, J. S. Hawkings, and D. R. Herter. 1981. Evaluating belt transects for censusing waterbirds on the east Copper River delta, Alaska. Pages 123-132 in Symp. on Census and Inventory Techniques for Populations and Habitats. Proc. Northwest Sect. Wildl. Soc., Banff, Alberta, Canada.

Spindler, M. A., S. M. Murphy, and B. Kessel. 1981. Ground censuses of waterbird populations and productivity in the Upper Tanana River Valley. Pages 133-148 in F. L. Miller and A. Gunn, eds. Symp. on Census and Inventory Techniques for Populations and Habitats. Proc. Northwest Sect. Wildl. Soc., Banff, Alberta, Canada.

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PRESENTED PAPERS:

Murphy, S. M., and B. A. Anderson. 1992. The effects of the Lisburne Oil Development Project on goose nesting in Prudhoe Bay, Alaska, 1985-1989. Paper presented at the Seventh N. Am. Arctic Goose Conf., 7-12 Jan. 1992, Vallejo, CA.

Murphy, S. M., C. L. Cranor, and R. G. White. 1989. Behavioral responses of Delta herd caribou to low-level, subsonic jet aircraft overflights. Fourth N. Am. Caribou Workshop, 1-3 Nov. 1989, St. John's, Newfoundland, Canada.

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Murphy, S. M., and R. M. Burgess. 1987. Research strategies for evaluating the impacts of oil development on geese and swans. Paper presented at the Alaska Bird Conf. and Workshop, 3-4 April 1987, Juneau, and at the First Annu. Meeting_Alaska Assoc. of Environ. Professionals, 15 May 1987, Anchorage, AK.

Murphy, S. M., and R. J. Ritchie. 1986. Applied use of behavior data for the assessment of impacts on wildlife. Poster presented at the Intl. Behavioral Ecologists Meeting, October, 1986, Albany, NY.

Murphy, S. M. 1985. Ecological segregation of migrating shorebirds on the eastern Copper River delta, Alaska. Abstract. Alaska Bird Conf. and Workshop, Anchorage, AK.

Murphy, S. M., B. Kessel, and L. J. Vining. 1981. Waterfowl populations and nutrient levels in taiga ponds. Paper presented at the 32nd Alaska Sci. Conf., AAAS, 25-27 Aug. 1981, Fairbanks, AK.

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Anderson, B. A., S. M. Murphy, M. T. Jorgenson, J. A. Ciarletta, and B. A. Kugler. 1991. GHX-1 waterbird and noise monitoring program. 1990 annu. rep. prepared for ARCO Alaska, Inc., Anchorage, AK, by Alaska Biological Research, Inc., Fairbanks, AK and BBN Systems and Technologies Corp., Canoga Park, CA. 83 pp.

Anderson, B. A., S. M. Murphy, C. L. Cranor, M. T. Jorgenson, and B. A. Kugler. 1990. GHX waterbird and noise monitoring program. 1989 annu. rep. prepared for ARCO Alaska, Inc., Anchorage, AK, by Alaska Biological Research, Inc., Fairbanks, AK and Acentech, Inc., Canoga Park, CA. 109 pp.

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Anderson, B. A., M. A. Robus, J. A. Curatolo, and S. M. Murphy. 1986. Habitat analysis and wildlife values of an alternative site for the proposed Drill Site 3R, Kuparuk Oilfield, Alaska, 1985. Unpubl. rep. prepared for ARCO Alaska, Inc. and Kuparuk River Unit Owners, Anchorage, AK, by Alaska Biological Research, Fairbanks, AK.

Robus, M. A., S. M. Murphy, R. M. Burgess, and B. A. Anderson. 1986. Natural revegetation and bird use of three disturbed sites in the Kuparuk Oilfield, Alaska, 1985. Unpubl. rep. prepared for ARCO Alaska, Inc., Anchorage, AK, by Alaska Biological Research, Fairbanks, AK. 75 pp.

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Kessel, B., S. M. Murphy, and L. J. Vining. 1980. Wetlands and waterbirds, Chisana-Upper Tanana River Valley, Alaska, 1979. Unpubl. rep. prepared for Northwest Alaska Pipeline Co., by Univ. Alaska Museum, Fairbanks, AK. 126 pp.

Batten, A. R., S. M. Murphy, and D. F. Murray. 1978. Definition of Alaskan coastal wetlands by floristic criteria. Environmental Protection Agency Report No. 804965-01, prepared for the EPA, Corvallis, OR, by the Institute of Arctic Biology, Univ. Alaska, Fairbanks, AK. 489 pp.

PROFESSIONAL MEMBERSHIPS:

American Ornithologists' Union
Association of Field Ornithologists
Pacific Seabird Group
The Wildlife Society

Wader Study Group

RESUME

ROBERT H. DAY

SENIOR SCIENTIST

EXPERTISE: ORNITHOLOGY (BREEDING BIOLOGY, FEEDING ECOLOGY, PELAGIC DISTRIBUTION OF SEABIRDS, MIGRATION, SEABIRD-FISHERY INTERACTIONS), MARINE POLLUTION, BIOLOGICAL OCEANOGRAPHY.

EDUCATION: B.A., Environmental Sciences, 1974. Antioch College, Yellow Springs, OH.
M.S., Zoology, 1980. University of Alaska, Fairbanks, AK.
Ph.D., Oceanography, 1992. University of Alaska, Fairbanks, AK.

RESEARCH
PROFILE: Bob has 20 years of research experience in Alaska and elsewhere, in both marine and terrestrial studies. He has conducted research on such diverse topics as: effects of the *Exxon Valdez* oil spill on birds and mammals; the quantitative distribution of tarballs, marine debris, plastic pollutants and seabirds in the North Pacific and Bering Sea with respect to oceanography; the mortality of seabirds in gillnets used by foreign fishing fleets; the distribution of mesopelagic fishes and squids in the North Pacific; reproductive and feeding biologies of seabirds in the Gulf of Alaska, Aleutian Islands, and Bering Sea; the biology of gulls in Kenai Fjords National Monument; the ingestion of plastic pollutants by seabirds; nocturnal migration of birds in the Midwest, using radar; and censuses of seabird, marine mammal, and raptor populations in the Shumagin and Aleutian islands. In addition he has assisted in research on the effects of weather patterns on sea ice in the Bering Sea; the effects of oil development on waterfowl in the Prudhoe Bay oilfields; and the effects of the Alyeska Pipeline terminal on intertidal and subtidal benthic communities and feeding of fishes, crabs, and shrimps in Port Valdez. He is currently involved as a Principal Investigator on two long-term monitoring programs: studying the effects of the *Exxon Valdez* oil spill on birds and mammals in Prince William Sound and on the Kenai Peninsula. In addition to his responsibilities as a research biologist, Bob serves as an assistant editor for ABR and assists in preparation of publications.

RESEARCH EXPERIENCE:

Co-Principal Investigator, Bird Migration Studies. Studying patterns of migration of birds through a windpower site in Tarifa, Spain, to determine patterns of movement with respect to weather conditions. The information generated will be used to design a set of operational procedures for the windpower company to follow, so that it can minimize bird collisions with wind turbines.

Principal Investigator, Spectacled Eider Studies. Studying the distribution, abundance, and habitat use of this endangered species on 10 Long-range Radar Sites (formerly DEW-line sites) in northwestern and northern Alaska.

Co-Principal Investigator, Oilspill Studies. Studying the impacts to and recovery of wildlife from effects of the *Exxon Valdez* oil spill. Studies were on a diverse suite of birds and mammals and were conducted in Prince William Sound and on the Kenai Peninsula (1989-1994).

Principal Investigator, OTH-B (Over-The-Horizon, Backscatter) Radar Avian Studies. Studying the nocturnal migration of birds with respect to weather conditions near potential OTH-B radar sites in South Dakota and Minnesota (1989).

Co-principal Investigator, Marine Pollution Studies. Studied the quantitative distribution of tarballs, marine debris, and plastic pollutants in the Gulf of Alaska, North Pacific, and Bering Sea with respect to oceanography. Studied the decomposition of plastic debris at sea and its ingestion by and entanglement of seabirds, marine mammals, fishes, and squids (1976-1980, 1984-1989).

Principal Investigator, Studies of Seabirds at Sea. Studied the quantitative distribution, behavior, and migrations of seabirds in relation to oceanographic parameters, including extensive pelagic surveys in the Gulf of Alaska, North Pacific, and Bering Sea aboard NSF, NOAA, and foreign research vessels (1982-1988).

Principal Investigator, Seabird-Gillnet Studies. Studied the species composition, behavior, numbers, and mortality rates of seabirds killed in drift gillnets fished for squid and salmon in the North Pacific by Japanese, Korean, and Taiwanese fishermen (1982-1987).

Principal Investigator, Flying Squid Fishery Studies. Studied the oceanography; the species composition and abundance of zooplankton; the species composition and vertical distribution of mesopelagic fishes and squids that are eaten by Dall's Porpoises; and the quantitative distribution of seabirds and marine mammals in the North Pacific flying squid fishery (1987-1988).

Research Associate, Sea Ice-Atmospheric Studies. Worked with Dr. Joseph Niebauer of the University of Alaska on computer time-series analyses of oceanographic and atmospheric data sets, to determine the importance of several variables in affecting interannual patterns of sea ice, sea-surface temperatures, and air temperatures in the Bering Sea (1987).

Principal Investigator/Research Associate, Seabird Biology Studies. Studied the feeding biology of several species of seabirds; the nesting biology, nest-site characteristics, and reproductive performance of seabirds; and techniques for conducting seabird censuses at several locations in the Shumagin and Aleutian islands and Bering Sea (1975-1978, 1980-1983).

Research Assistant, Port Valdez Environmental Studies. Assisted Dr. Howard Feder of the University of Alaska with studies on the effects of discharge and tanker operations on the biology, species composition, feeding, and survivorship of intertidal and subtidal benthic invertebrates in Port Valdez. Also assisted with studies on species composition and distribution of benthic invertebrate communities for OCS offshore oil studies in the Bering Sea (1980-1983).

Research Associate, Gull Studies. Studied the effects of food and habitat characteristics on the reproductive performance of Glaucous-winged Gulls in Kenai Fjords National Monument. Also, conducted censuses of other seabirds and assisted with studies on ice-inhabiting Harbor Seals (1979).

Principal Investigator, Aleutian and Shumagin islands Wildlife Studies. Mapped and conducted censuses of seabird, marine mammal, and raptor colonies and populations in the central and western Aleutian Islands National Wildlife Refuge (1977-1978) and the Shumagin Islands Unit of the Alaska Maritime National Wildlife Refuge (1976).

Research Assistant, Puffin Studies. Assisted with research on breeding biology and feeding ecology of puffins in the western Aleutian Islands (1975).

EMPLOYMENT HISTORY:

ALASKA BIOLOGICAL RESEARCH, INC. Senior Scientist, 1989-present. Research Associate, 1986-1988 (part-time).

U.S. FISH AND WILDLIFE SERVICE, OFFICE OF MIGRATORY BIRDS, Washington, DC. Research Consultant, 1988.

N.O.A.A., NATIONAL MARINE FISHERIES SERVICE, Auke Bay Laboratory, Juneau, AK. Research Consultant, 1986-1988 (intermittent contracts).

JOINT INSTITUTE OF MARINE AND ATMOSPHERIC RESEARCH, UNIVERSITY OF HAWAII, Honolulu, HI. Research Consultant, 1988.

N.O.A.A., NATIONAL MARINE FISHERIES SERVICE, NATIONAL MARINE MAMMAL LABORATORY, Seattle, WA. Chief Scientist/Research Consultant, 1987-1988.

INSTITUTE OF MARINE SCIENCES, UNIVERSITY OF ALASKA, Fairbanks, AK. Graduate Research Assistant, 1983-1988 (part-time). Research Assistant/Research Associate, 1980-1983.

ALASKA PARKS STUDIES UNIT, UNIVERSITY OF ALASKA, Fairbanks, AK. Research Associate, 1979.

U.S. FISH AND WILDLIFE SERVICE, ALEUTIAN ISLANDS NATIONAL WILDLIFE REFUGE, ADAK, AK. Research Associate, 1977-1978. Research Assistant, 1975.

U.S. FISH AND WILDLIFE SERVICE, OFFICE OF BIOLOGICAL SERVICES, Anchorage, AK. Research Associate, 1976.

DIVISION OF LIFE SCIENCES, UNIVERSITY OF ALASKA, Fairbanks, AK. Teaching Assistant, 1983, 1976-1979.

PUBLICATIONS:

Day, R. H., S. M. Murphy, J. A. Wiens, G. D. Hayward, E. J. Harner, and L. N. Smith. In press. Use of oil-affected habitats by birds after the *Exxon Valdez* oil spill. Pages XXX-XXX *in* P. G. Wells, J. N. Butler, and J. S. Hughes, eds. *Exxon Valdez* oil spill: environmental impact and recovery assessment. Special Technical Publication 1219, American Society for Testing and Materials, Philadelphia, PA.

Day, R. H. 1995. New information on Kittlitz's Murrelet nests. Condor 97: 271-273.

Shaw, D. G., and R. H. Day. 1994. Color- and form-dependent loss of neuston plastic in the North Pacific Ocean. Mar. Pollut. Bull. 28: 39-43.

DeGange, A. R., R. H. Day, J. E. Takekawa, and V. M. Mendenhall. 1993. Losses of seabirds in gillnets in the North Pacific. Pages 204-211 *in* K. Vermeer, K. T. Briggs, K. H. Morgan, and D. Siegel-Causey, eds. The status, ecology, and conservation of marine birds of the North Pacific. Can. Wildl. Serv. Spec. Publ., Ottawa.

Murphy, E. C., A. A. Hoover-Miller, R. H. Day, and K. L. Oakley. 1992. Intracolony variability during periods of poor reproductive performance at a Glaucous-winged Gull colony. Condor 94: 598-607.

Cooper, B. A., R. H. Day, R. J. Ritchie, and C. L. Cranor. 1991. An improved marine radar system for studies of bird migration. J. Field Ornithol. 62: 367-377.

DeGange, A. R. and R. H. Day. 1991. Mortality of seabirds in the Japanese land-based gill-net fishery for salmon. Condor 93: 251-258.

Day, R. H., D. G. Shaw, and S. E. Ignell. 1990. Quantitative distribution and characteristics of marine debris in the North Pacific Ocean, 1984-1988. Pages 182-211 *in* R. S. Shomura and M. L. Godfrey, eds. Proceedings of the Second International Conference on Marine Debris, Honolulu, HI. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154.

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

Jewett, S. C., R. H. Day, and H. M. Feder. 1989. Feeding biology of the blackfin sculpin (*Malacocottus kincaidi*, Gilbert and Thompson 1905) and the spinyhead sculpin (*Dasycottus setiger*, Bean 1890) in the northeastern Gulf of Alaska. Pac. Sci. 43: 144-151.

Niebauer, H. J., and R. H. Day. 1989. Causes of interannual variability in the sea ice cover of the eastern Bering Sea. Geojournal 18: 45-59.

Day, R. H., A. R. DeGange, G. J. Divoky, and D. M. Troy. 1988. Distribution and subspecies of the Dovekie in Alaska. Condor 90: 712-714.

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Murphy, E. C., R. H. Day, K. L. Oakley, and A. A. Hoover. 1984. Dietary changes and poor reproductive performance in Glaucous-winged Gulls. Auk 101: 532-541.

Day, R. H., K. L. Oakley, and D. R. Barnard. 1983. Nests and eggs of Kittlitz's and Marbled murrelets. Condor 85: 265-273.

Byrd, G. V., R. H. Day, and E. P. Knudtson. 1983. Activity patterns and census techniques of auklets (*Aethia* spp.) at Buldir Island, Alaska. Condor 85: 274-280.

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Day, R. H., E. P. Knudtson, D. W. Woolington, and R. P. Schulmeister. 1979. *Caprimulgus indicus*, *Eurynorhynchus pygmeus*, *Otus scops*, and *Limicola falcinellus* in the Aleutian Islands, Alaska. Auk 96: 189-190.

MANUSCRIPTS UNDER REVIEW:

Day, R. H., and B. A. Cooper. In review. Patterns of movement of Dark-rumped Petrels and Newell's Shearwaters on Kauai. Condor.

Day, R. H., S. M. Murphy, J. A. Wiens, G. C. Hayward, E. J. Harner, and L. N. Smith. In review. The effects of the *Exxon Valdez* oil spill on habitat use by birds in Prince William Sound, Alaska. Ecological Applications.

Murphy, S. M., R. H. Day, J. A. Wiens, and K. R. Parker. In review. Effects of the *Exxon Valdez* oil spill on birds: comparisons of pre- and post-spill surveys in Prince William Sound, Alaska. Auk.

Wiens, J. A. T. O. Crist, R. H. Day, S. M. Murphy, and G. D. Hayward. In review. Effects of the *Exxon Valdez* oil spill on marine bird communities in Prince William Sound, Alaska. Ecology.

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Day, R. H., R. J. Ritchie, and D. A. Flint. 1995. Spectacled and Steller's Eider surveys at remote Air Force sites in Alaska, 1994. Unpubl. rep. prepared for EA Engineering, Science, and Technology, Redmond, WA, and The United States Air Force, Eielson Air Force Base, AK, by ABR, Inc., Fairbanks, AK. 66 pp.

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Day, R. H., and L. C. Byrne. 1989. Avian Research Program for the over-the-horizon backscatter central radar system, spring 1989: radar studies of bird migration. Unpubl. rep. prepared for Metcalf and Eddy, Inc./Holmes and Narver, Inc., Wakefield, MA. by Alaska Biological Research, Inc., Fairbanks, AK. 102 pp.

Day, R. H. 1988. Quantitative distribution and characteristics of neuston plastic in the North Pacific Ocean. Unpubl. rep. prepared for N.O.A.A., N.M.F.S., Auke Bay Laboratory, Auke Bay, AK. 73 pp.

Day, R. H. 1988. Seabirds and the North Pacific flying squid fishery: a preliminary study. Unpubl. rep. prepared for U.S. Fish and Wildlife Service, Office of Migratory Bird Management, Washington, DC. 77 pp.

Day, R. H. 1988. The species composition, abundance, behavior, and mortality of seabirds in the North Pacific flying squid fishery: a preliminary study. Unpubl. rep. prepared for Joint Institute of Marine and Atmospheric Research, Univ. of Hawaii, Honolulu, HI. 51 pp.

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Day, R. H. 1986. Report on the cruise of the *Pusan 851* to the North Pacific Ocean, July-August 1986. Unpubl. rep. prepared for N.O.A.A., N.M.F.S., Auke Bay Laboratory, Auke Bay, AK. 93 pp.

Feder, H. M., R. H. Day, S. C. Jewett, K. McCumby, S. McGee, and S. V. Schonberg. 1985. The infauna of the northeastern Bering and southeastern Chukchi seas. Environmental assessment of the Alaskan continental shelf, final rep. 32: 1-120.

Day, R. H. 1980. The occurrence and characteristics of plastic pollution in Alaska's seabirds. M. S. Thesis, Univ. of Alaska, Fairbanks, AK. 111 pp.

Moe, R. A., and R. H. Day. 1979. Populations and ecology of seabirds of the Koniuji Group, Shumagin Islands, Alaska. Environmental assessment of the Alaskan continental shelf, annu. rep. 2: 395-491.

Day, R. H., B. E. Lawhead, T. J. Early, and E. B. Rhode. 1978. Results of a marine bird and marine mammal survey of the western Aleutian Islands. U.S. Fish and Wildlife Service, Unpubl. annu. rep. Aleutian Islands NWR, Adak, AK. 243 pp.

Day, R. H., E. P. Knudtson, and T. J. Early. 1978. A bird and mammal survey of the west-central Aleutian Islands. U.S. Fish and Wildlife Service, annu. rep. Aleutian Islands NWR, Adak, AK. 180 pp.

PROFESSIONAL MEMBERSHIPS:

African Seabird Group
American Ornithologists' Union (Life Member)
Association of Field Ornithologists (Life Member)
British Ornithologists' Union (Life Member)
Colonial Waterbird Group (Life Member)
Cooper Ornithological Society (Life Member)
Ornithological Society of New Zealand
Pacific Seabird Group (Life Member)
Royal Australasian Ornithologists' Union
Sigma Xi, the Scientific Research Society
Society of Western Field Ornithologists (Life Member)
Wilson Ornithological Society (Life Member)

HONORS/ACHIEVEMENTS/PUBLIC SERVICE:

1994	Listed in *Dictionary of International Biography* (23rd ed.)
1993-present	Named to Endangered Species Recovery Team for Spectacled Eiders by U.S. Fish and Wildlife Service, AK.
1993	Listed in *Who's Who in the West* (24th ed.)
1993	Co-chair of Local Committee for 111th Annual Meeting of the AOU, Fairbanks, AK.
1988-1989	Board of Directors of Alaska Chapter Sigma Xi, the Scientific Research Society
1987-1988	Resource Fellow, University of Alaska, Fairbanks, AK.
1987	Sea Grant Fellow, University of Alaska, Fairbanks, AK.
1987	Listed in *Who's Who in American Universities and Colleges.*
1985-1986	Angus Gavin Memorial Fellow, University of Alaska, Fairbanks, AK.
1980	Most Outstanding Student in Biological Sciences, University of Alaska, Fairbanks, AK.
1970-1974	Alfred P. Sloan Scholar, Antioch College, Yellow Springs, OH.

RESUME

CHARLES B. (RICK) JOHNSON

SENIOR RESEARCH BIOLOGIST

EXPERTISE: MAMMALOGY, ORNITHOLOGY, HABITAT EVALUATION, DATA ANALYSIS, FORESTRY.

EDUCATION: B.S. in Wildlife Biology, 1978. University of Montana, Missoula.

M.S. in Wildlife Management, 1985. University of Alaska, Fairbanks.
Thesis Title: Use of coastal habitat by mink on Prince of Wales Island, Alaska.

RESEARCH PROFILE: Rick has been involved in field studies of Alaskan wildlife since 1980. His work has focused on research in habitat relationships, behavioral ecology, foraging ecology, and productivity of a variety of mammals, seabirds, and waterfowl. He has worked on studies of ecology of mink and river otters on timber-harvested coastlines of southeast Alaska, brown bear-human interactions on Admiralty Island, walrus and seal harvests on St. Lawrence Island, seabird population studies on St. Matthew Island, moose activity budgets and forage selection on the Seward Peninsula, behavior and nesting success of water birds in the Prudhoe Bay area, distribution and movements of caribou in the Central Arctic Herd, and productivity of arctic foxes around North Slope oilfields. In addition, he worked on forestry and wildlife programs in northwestern Montana prior to his arrival in Alaska. Lately he has been involved in studies using marine radar to study the migration and flight behavior of birds in Alaska, Hawaii, and New York. He has been the principal investigator on studies of habitat use by mink and river otters in Prince William Sound, status and recovery of sea otters after an oil spill in Prince William Sound, and the abundance and distribution of nesting eiders on the Colville River Delta. Rick's broad research experience has developed specific skills in analysis of habitat use, forest-wildlife relationships, and population trends.

RESEARCH EXPERIENCE: Principal Investigator, **Colville River Delta eider studies**. Studied the abundance and distribution of Spectacled and King eiders during the pre-nesting and nesting seasons (1994).

Principal Investigator, **Prince William Sound sea otter study.** Conducted multi-year study of habitat-use, behavior, and recovery of sea otters after the *Exxon Valdez* oil spill (1990–1994).

Research Biologist, **Prince William Sound wildlife studies.** Collected abundance and distribution data on seabirds and marine mammals after the *Exxon Valdez* oil spill (1989–1994).

Research Biologist. **Bird migration studies at wind turbine sites in the Lake Ontario region, New York.** Used marine radar and visual techniques to measure movement rates and flight behavior of birds and determine impact of wind turbines (1994).

Research Biologist, **North Slope arctic fox productivity studies.** Estimated fox productivity at den sites and trapped and marked foxes in the vicinity of Prudhoe Bay (1992–1993).

Research Biologist, **Shearwater and Petrel studies on Kauai.** Used marine radar to monitor movements, identify flight corridors, and observe flight behavior of Newell's Shearwaters and Dark-rumped Petrels on the island of Kauai, Hawaii (1993)

Research Biologist, **Spectacled Eider studies on the Central Arctic Coastal Plain.** Conducted aerial and ground surveys for Spectacled and King eiders on the Colville River Delta and Kuparuk Oilfield (1993).

Research Biologist, **Caribou distribution on the Central Arctic Coastal Plain.** Conducted aerial surveys and analyzed distributional data for caribou on the Colville River Delta and the Kuparuk Oilfield (1993).

Principal Investigator, **Prince William Sound mink and river otter studies.** Initiated field studies of mink and river otter recovery around Knight Island after the *Exxon Valdez* oil spill (1989–1990).

Project Leader, **Point McIntyre waterbird and noise monitoring program.** Evaluated water bird populations and existing noise environment of Point McIntyre area, and collected information on distribution, numbers, and success of water bird nests (1989).

Project Leader, **Kuparuk caribou studies.** Conducted a study of the distribution, movements, and behavior of caribou from the Central Arctic Herd with respect to oilfield facilities and activities in the Kuparuk Oilfield (1988).
Research Biologist, **Lisburne terrestrial monitoring program.** Evaluated nest fates, nest attendance, and activity budgets of Canada Geese, and effects of disturbance with time-lapse photography. Collected behavior, disturbance, and productivity information on Brant, Canada and White-fronted Geese, and Tundra Swans (1987–1990).

Research Assistant, **Alaska Cooperative Wildlife Research Unit moose-willow study.** Helped design sampling plan, established remote field camp, recorded activity budgets of moose, and determined use-availability of willow species during late winter on Seward Peninsula (1987).

Research Biologist, **Population status of seabirds on St. Matthew and Hall Islands.** Assessed reproductive success of Pelagic Cormorants. Collected nest attendance, breeding success, and food habits data on four species of seabirds. Determined nest attendance with time-lapse photography. Coauthored final report. Presented results at Pacific Seabird Group Meetings (1985–1986).

Research Biologist, **ANWR Wildlife data analysis.** Advised biologists on statistical analyses. Performed entry and analysis of caribou, wolf, and brown bear data under contract with U.S. Fish and Wildlife Service (1985–1986).

Research Assistant, **Institute of marine science Port Valdez studies.** Collected benthic samples in Port Valdez from *RV Alpha Helix* (1985).

Research Assistant, **Alaska Cooperative Wildlife Research Unit reindeer grazing study.** Sorted and identified lichens collected from St. Matthew and Hall Islands. Measured live and dead biomass and analyzed data (1985).

Research Assistant, **Institute of Arctic Biology caribou energetics study.** Mapped Porcupine caribou movements from satellite location data and analyzed elevational change. Assisted with implantation of heart rate monitor and conducted treadmill and snowfield experiments with walking caribou (1985).

Research Assistant, **Alaska Cooperative Wildlife Research Unit Pack Creek brown bear Study.** Advised on sample design and data collection of bear-people interactions on Admiralty Island. Recorded bear behavior, trapped and marked bears, conducted aerial survey, and located bears with radio telemetry (1983–1984).

Biologist, **U.S. Fish and Wildlife walrus harvest monitoring program.** Monitored the walrus and seal harvest by native hunters on St. Lawrence Island. Collected tissue samples and analyzed data and wrote final report (1984).

Research Assistant, **Alaska Cooperative Wildlife Research Unit furbearer studies.** Designed and organized a study of habitat use by coastal mink in logged areas of southeast Alaska. Evaluated habitat use, determined food habits, and measured home ranges. Examined factors affecting use of intertidal zones. Trapped and marked mink, pine marten, and river otters. Determined home ranges of mink with radio telemetry (1980–1982).

Forester, **Stone, Smart, and Shirley.** Advised contractors on bids for forestry contracts in Libby, Montana. Trained a crew for timber inventory (1979–1980).

Forest Technician, **U.S. Forest Service, Kootenai National Forest.** Planned and conducted habitat analysis of grizzly bears on proposed timber sales near Libby, Montana. Identified and mapped bear habitat on sale area. Performed other forestry work (1977–1979).

Research Assistant, **Border Grizzly Project, Univ. of Montana.** Conducted study of subdivision development in grizzly habitat in Montana. Assisted with trapping and locating bears (1976).

Research Assistant, **Wolf Ecology Project.** Conducted study of wolf reports and sightings in northwestern Montana (1976).

EMPLOYMENT HISTORY:

ALASKA BIOLOGICAL RESEARCH, INC., Research Biologist, May 1987-September 1991. Senior Research Biologist, October 1991-present.

ALASKA COOPERATIVE WILDLIFE RESEARCH UNIT, Fairbanks, AK. Research Assistant, February-May 1987, October 1986, October 1985, July-August 1984, May-September 1983, May 1980-December 1982.

INSTITUTE OF ARCTIC BIOLOGY, UNIVERSITY OF ALASKA, FAIRBANKS, AK, Research Biologist, June-December 1986, May-September 1985, Research Assistant, October 1984-March 1985.

U.S. FISH AND WILDLIFE SERVICE, Fairbanks, AK, Research Biologist, December 1985-June 1986; Gambell, AK, Biologist, April 1984-March 1985.

INSTITUTE OF MARINE SCIENCE, Fairbanks, AK, Research Assistant, November 1985.

STONE, SMART, AND SHIRLEY, Libby, Montana, Forester, March 1980-May 1980.
U.S. FOREST SERVICE, KOOTENAI NATIONAL FOREST, Libby, Montana, Forest Technician, May 1977-November 1979.

UNIVERSITY OF MONTANA, Missoula, BORDER GRIZZLY PROJECT and WOLF ECOLOGY PROJECT, Research Assistant, June 1976-September 1976.

PAPERS AND REPORTS

Johnson, C. B., and D. L. Garshelis. In review. Sea otter abundance, distribution, and pup production in Prince William Sound, following the *Exxon Valdez* oil spill. *In* P. G. Wells, J. N. Butler, and J. S. Hughes (eds). *Exxon Valdez* oil spill: fate and effects in Alaskan waters. STP 1219, American Society for Testing and Materials, Philadelphia, PA.

Johnson, C. B. 1995. Abundance and distribution of eiders on the Colville River Delta, Alaska, 1994. Unpubl. rep. prep. for ARCO Alaska, Inc., Anchorage, AK, by ABR, Inc., Fairbanks, AK.

Cooper, B. C., C. B. Johnson, and R. J. Ritchie. 1994. Bird migration near existing and proposed wind turbine sites in the eastern Lake Ontario region. Unpubl. rep. prep. for Niagara Mohawk Power Corporation, Syracuse, NY, by Alaska Biological Research, Inc., Fairbanks, AK. 71 pp.

Smith, L. N., L. C. Byrne, C. B. Johnson, and A. A. Stickney. 1994. Wildlife studies on the Colville River delta, Alaska, 1993. Unpubl. rep. prep. for ARCO Alaska, Inc., Anchorage, AK, by Alaska Biological Research, Inc., Fairbanks, AK. 95 pp.

Lawhead, B. E., C. B. Johnson, and L. C. Byrne,. 1994. Caribou surveys in the Kuparuk Oilfield during the 1993 calving and insect seasons. Rep. prepared for ARCO Alaska, Inc. and Kuparuk River Unit, Anchorage, AK, by Alaska Biological Research, Inc., Fairbanks, AK 38 pp.

Lawhead, B. E., L. C. Byrne, and C. B. Johnson. 1993. Caribou synthesis. Final rep., 1987-90 Endicott Environmental Monitoring Program, U.S. Army Corps of Engineers, Alaska District, Anchorage, prepared for Science Applications Intl. Corp., Anchorage, AK. by Alaska Biological Research, Inc., Fairbanks, AK.

Johnson, C. B., S. M. Murphy, C. L. Cranor, M. T. Jorgenson, and B. A. Kugler. 1990. Point McIntyre waterbird and noise monitoring program. Unpubl. rep. prepared for ARCO Alaska, Inc., Anchorage, AK. by Alaska Biological Research, Inc., Fairbanks, AK. and Acentech, Inc., Canoga Park, CA.

Johnson, C. B. and B. E. Lawhead. 1989. Distribution, movements, and behavior of caribou in the Kuparuk Oilfield, summer 1988. Unpubl. rep. prepared for ARCO Alaska, Inc., Anchorage, AK. by Alaska Biological Research, Inc., Fairbanks, AK. 71 pp.

Johnson, C. B. and S. M. Murphy. 1989. Use of time-lapse photography to study geese nesting at Prudhoe Bay, Alaska, 1986-1988. Alaska Bird Conference and Workshop, 20–22 March 1989, Fairbanks, AK.

Johnson, C. B. 1989. The effects of seasonal and tidal variation and prey selection on the diets of mink in coastal southeast Alaska. 69th annu. meeting American Society of Mammologists, 11–15 June 1989, Fairbanks, AK.

Johnson, C. B. and R. Rohleder. 1986. Nesting success of Pelagic Cormorants on St. Matthew and Hall islands, Alaska. Proc. 1986 Pacific Seabird Group Meeting, Lapaz, U.B.C.S., Mexico.

Johnson, C. B. 1985. Use of coastal habitat by mink on Prince of Wales Island, Alaska. M. S. Thesis. Univ. of Alaska, Fairbanks, AK. 179 pp.

Johnson, C. B. 1985. Seasonal ranges and territoriality of coastal mink in southeast Alaska. Proc. Arctic Science Conference. Fairbanks, AK.

Johnson, C. B. 1982. Habitat use by mink in relation to clearcutting on Prince of Wales Island. Proc. 33rd Alaska Science Conference. Fairbanks, AK.

Johnson, C. B. 1981. Habitat use by mink on Prince of Wales Island. Proc. 32nd Alaska Science Conference. Fairbanks, AK.

Murphy, E. C., B. A. Cooper, P. D. Martin, C. B. Johnson, B. E. Lawhead, A. M. Springer, and D. L. Thomas. 1987. The population status of seabirds on St. Matthew and Hall islands, 1985, and 1986. Unpubl. rep. OCS Study, MMS 87-0043, prepared for U.S. Dep. Intern., Minerals, Manage. Serv., Anchorage, AK. [Contract No. 14–12–001–30222237]. 154 pp.

Murphy, S. M., B. A. Anderson, C. L. Cranor, and C. B. Johnson. 1988. Lisburne Terrestrial Monitoring Program–1987: the effects of the Lisburne Development Project on geese and swans. Unpubl. third annu. rep. prepared for ARCO Alaska, Inc., Anchorage, AK. by Alaska Biological Research, Inc., Fairbanks, AK. 205 pp.

Common Murre Population Monitoring

Project Number:	96144
Restoration Category:	Monitoring
Proposer:	DOI-FWS
Lead Trustee Agency:	USFWS
Cooperating Agency:	None
Duration:	7 years
Cost FY 96:	$101,700
Cost FY 97:	$125,300
Cost FY 98:	$44,000
Cost FY 99:	$135,500
Cost FY 00:	$138,500
Cost FY 01:	$46,000
Cost FY 02:	$138,500
Geographic Area:	In FY 96, field work will be conducted at breeding colonies in and near Puale Bay (e.g., Cape Aklek, Jute Peak, Puale Bay proper) and at Ugaiushak Island, Alaska. In FY 97, counts will occur at the Barren and Triplet Islands, and in FY 98 the Chiswell Islands will be the study area. The sequence then is repeated through FY 2002.
Injured Resource/Service:	Common murres

ABSTRACT

The project is designed to determine whether common murre populations at a series of index colonies within the area affected by the T/V *Exxon Valdez* oil spill are recovering. This objective will be accomplished by counting murres at all five locations to document the presence or absence of post-spill population trends. Each location will be surveyed every 3 years, but the field work is planned so that a portion of it will be accomplished annually (i.e., colonies in the western portion of the spill zone will be surveyed in FY 96, central colonies will be counted in FY 97, and the easternmost colonies will be visited in FY 98). This cycle will be repeated through FY 02.

INTRODUCTION

The common murre was the most frequently killed bird during the 1989 T/V *Exxon Valdez* oil spill (Piatt *et al.* 1990, ECI 1991). Populations of murres at five colonies (i.e., Chiswell Islands, Barren Islands, Triplet Islands, Ugaiushak Island, and Puale Bay) were lower after the spill than before it (Nysewander *et al.* 1993). By 1992, there was no evidence of recovery in numbers at the Chiswells, the Barrens, or at Puale Bay (Dragoo et al. 1994) and murres were not counted in 1992 at Ugaiushak or the Triplets. No counts have been made except in the Barren Islands since 1992, and Barren Islands counts in 1993 (Roseneau *et al.* 1995) and 1994 (D.G. Roseneau unpubl. data) do not yet provide evidence of recovery.

This restoration monitoring proposal will address the question of whether postspill populations are beginning to recover to pre-spill numbers. Because of the reproductive strategy characteristic of long-lived animals like murres, population growth may occur relatively slowly, therefore, counts will be made at 3-year intervals at each of the 5 index locations referred to above. In FY 1996 murres will be recensused at 3 colonies in the vicinity of Puale Bay (i.e., Cape Aklek, Jute Peak, and Puale Bay proper) and at nearby Ugaiushak Island. These colonies were last surveyed in 1991 and 1992, respectively (Dewhurst 1991, Dewhurst and Moore 1992, McCarthy and Dewhurst 1993, Nysewander *et al.* 1993). In FY 97, colonies in the Barrens (i.e., East Amatuli, East Amatuli Light Rock, and Nord) and the Triplets will be censused, and in FY 98 counts will be made at 6 colonies in the Chiswell Islands. The sequence will begin again in FY 99 and continue throughout the end of the planning period (FY 02).

NEED FOR THE PROJECT

A. Statement of Problem

Common murres are listed as "not recovering" by the *Exxon Valdez* Oil Spill Trustee Council. Although total populations of common murres nesting at the Barren Islands colonies have not changed significantly in size over the 6-year period following the T/V *Exxon Valdez* oil spill, numbers of chicks per adult and productivity values were within normal ranges during 1992-1994 and 1993-1994, respectively (Dragoo *et al.* 1994; Roseneau *et al.* 1995; Roseneau *et al.*, unpubl. data). Furthermore, these productivity parameters returned to within normal bounds at Puale Bay by 1992 (Dragoo *et al.* 1994). If increases in breeding populations at these and other colonies affected by the oil spill are contingent on recruitment from the colonies themselves, it is only now becoming feasible to expect increases. This project will track populations at the 5 index colonies that have been selected for population monitoring to determine if recovery is underway.

B. Rationale

The project is needed to determine whether common murre populations have increased since the 1989 T/V *Exxon Valdez* oil spill.

C. Summary of Major Hypotheses and Objectives

The null hypothesis is that there is no increase in murre populations at index colonies. The objective of the surveys is to collect information on numbers of birds attending colonies for postspill trend analysis.

In FY 96, the specific objective is to estimate the average number of murres present at the breeding colonies in the vicinity of Puale Bay and at Ugaiushak Island for comparison with the counts made during 1989-1992 and 1990-1991, respectively.

D. Completion Date

The proposed project will be completed in FY 02. However, an annual report summarizing FY 96 results will be submitted to the Chief Scientist by May 15, 1997.

COMMUNITY INVOLVEMENT

A short article describing the FY 96 Common Murre Population Monitoring Study at Alaska Peninsula colonies will be prepared for the Trustee Council newsletter after FY 96 work is complete. Photographs showing these colonies will also be provided to Trustee Council staff for public viewing. The results of the study will be available to the public in Homer and Anchorage, and information from the project will be presented to the public during Trustee Council-sponsored workshops in 1996-1997. Efforts will also be made to involve 1 person from an oil spill community on Kodiak Island.

FY 96 BUDGET

Cost breakdowns for the FY 96 Common Murre Population Monitoring Study are shown on Forms 3A and 3B, and are summarized below.

Personnel	24.8
Travel	2.6
Contractual	68.1
Commodities	2.0
Equipment	0.0
Subtotal	97.5
Gen. Admin.	3.7
Total	101.2

PROJECT DESIGN

A. Objectives

The overall project objective is to determine postspill trends in murre breeding populations in the spill zone by triannually estimating the average number of common murres attending 5 index nesting colonies in the Gulf of Alaska.

In FY 96, the objective is to estimate the average number of murres present at colonies in the vicinity of Puale Bay and at Ugaiushak Island to determine if there is evidence of recovery at Alaska Peninsula nesting locations.

B. Methods

The proposed FY96 common murre restoration monitoring study has been designed to follow the Trustee Council Recovery Monitoring Strategy for common murres (EVOSTC 1994) and the guidelines listed in the Draft Restoration Plan (EVOSTC 1995). Murre colonies at Puale Bay, Cape Aklek, and Jute Peak will be recensused to determine whether population sizes have changed since the 1989 *Exxon Valdez* oil spill (counts were made at these colonies during 1989-1992; see Dewhurst 1991, Dewhurst and Moore 1992, McCarthy and Dewhurst 1993). Also, if weather conditions permit, a census team and inflatable boat will be dropped off at Ugaiushak Island (145 km south of Puale Bay), and this colony will be counted for comparison with data obtained in 1990-1991 (see Nysewander *et al.* 1993).

Field work will begin on 15 July and end on about 20 August. One contract vessel at least 20-m long and two 4.8-m long, outboard-powered inflatable rafts will be used for the work. Because the colonies are relatively far apart and 3 of them are located in Shelikof Strait (Puale Bay, Cape Aklek, and Jute Peak), the contract vessel will be needed to support the work to ensure that all counts are completed during the census period. To conserve funds, the vessel will also serve as base of operations for the study (i.e., no camp will be required at Puale Bay, and only a small spike camp will be needed at Ugaiushak Island).

Before the field season starts, we will obtain photographs showing plot boundaries used during the 1989-1992 studies. Although we may subdivide or combine some plots into smaller or larger units to make boundaries easier to find, we will make certain that among-year comparison capability is retained. Two types of counts will be made:

1. The entire colonies will be counted at least twice (whole-colony censuses) to obtain data directly comparable with with counts made after the spill. Postspill counts have been approximately as follows: Cape Aklek = 19,000 murres, Jute Peak = 14,000, Puale Bay proper = 2,500, Ugaiushak island = 5,000.

2. Selected pre-established index plots (multicount plots) will be counted at each colony on at least 5 different days to estimate the average number of birds present. The multicount plots will be selected on the basis of data histories, ease of counting, and accessibility. Efforts will be made to survey plots throughout the colonies in a manner that will sample breeding habitat types in general proportion to amounts found at the colonies; however, overall location of the plots will be dependent, in part, on data histories. Plots that are obviously difficult to count will be avoided, because counts made on these types of plots tend to introduce artificial variation into the data.

Most plots will be counted from inflatable boats or the larger contract vessel, whichever is deemed most appropriate. One set of plots historically counted from land will be surveyed from the previously established land-based observation point. All personnel counting the plots will have previous experience counting murres from boats. Counting procedures will mirror those described by Roseneau *et al.* (1995). Murres on multicount and whole-colony census plots will be counted by 10's with 7 x 42 binoculars, and 2 observers will count the plots simultaneously. One person will record the scores without revealing his/her own count to the other observer (if a third person is available, that person will serve as recorder). The recorder will compare the plot scores as they are being made to see if they are within 10% of each other (i.e., within 5% of their average). If they are not and time allows, the observers will recount the plots until both scores fall within this range. Murres on land-based plots will be counted by 1's with 7 x 42 binoculars (see Dewhurst 1991, Dewhurst and Moore 1992, McCarthy and Dewhurst 1993).

All counts will be made during the time of day and season when attendance on the cliffs is most stable (Hatch and Hatch 1989, Byrd 1989). At the Barren Islands colonies, attendance was most stable between 1100 and 2000 hrs. Because of longitudinal similarities, we will use this counting period for the Alaska Peninsula colonies. One or more around-the-clock hourly counts will be made at Puale Bay to check this counting period.

Attendance is most stable on the nesting cliffs between median lay dates and the beginning of chick fledging. Since we will not be collecting specific data on nesting chronology, we will start our counts after adult numbers stabilize on the nesting cliffs, and end them at the first sign of fledgling or declining numbers of adults.

For purposes of analysis, the 1-day totals on the different sets of plots (whole colony population census plots, multicount plots) will be the sample units (e.g. the total of the count made on Multicount Plots 1-8 at Cape Aklek on 1 date). One-way analysis of variance (ANOVA) and Tukey HSD multiple pairwise comparison tests will be used to check for differences among years, and we will use Kendall's Tau rank correlation test to check for presence of trends at the 0.1 significance level (the 0.1 significance level was selected to increase the power of the tests and reduce Type II error; the 0.90 confidence interval is both adequate and acceptable for our purposes).

C. Contracts and Other Agency Assistance

A contract will be required for a support vessel at least 20-m long (35 vessel days), and a small contract will also be needed for 1 Student Conservation Association volunteer to assist during the field work.

D. Location

The FY 96 work will be conducted at Puale Bay, Cape Aklek, Jute Peak, and Ugaiushak Island, along the eastern side of the Alaska Peninsula. No communities will be affected by the study.

SCHEDULE

A. Measurable Project Tasks for FY 96

November 1 - December 31:	Arrange for vessel contract, acquire plot photographs from D. Dewhurst, Alaska Peninsula/Becharof NWR
January 1 - April 1:	Arrange for and hire seasonal employees, finalize vessel contract, reproduce plot photographs, and make up census plot booklets for each colony
April 1 - May 31:	Arrange other logistical needs (order and purchase supplies; check outboard motors, inflatable rafts, tents, and survival gear)
June 1 - July 10:	Pack equipment and supplies for transport to the Alaska Peninsula study area
July 11-13:	Load equipment and supplies on contract vessel

July 15:	Depart Homer for study area (estimated travel time to Puale Bay, 30 hrs)
July 17 - August 19:	Collect data
August 20:	Depart study area and return to Homer
August 22:	Unload vessel
August 23 - September 1:	Clean and store equipment
September 2 -30:	Review and organize data
April 25, 1997:	Submit annual report to Chief Scientist for peer review

B. Project Milestones and Endpoints

August 1996	Field work completed at Puale Bay and Ugaiushak
May 1997	Annual report submitted for 1996 field work
August 1997	Field work completed at Barrens and Triplets
May 1998	Annual report submitted for 1997 field work
August 1999	Field work completed at Chiswells
May 1999	Final report on first complete round of population surveys
August 2000	Field work completed at Puale Bay and Ugaiushak
May 2001	Annual report submitted for 2000 field work
August 2001	Field work completed at Barrens and Triplets
May 2002	Annual report submitted for 2001 field work
August 2002	Field work completed at Chiswells
May 2003	Final report on project

C. Project Reports

See above Milestones

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

The proposed Common Murre Population Monitoring Study at the Alaska Peninsula nesting colonies is coordinated with Alaska Maritime National Wildlife Refuge (AMNWR) monitoring work at other locations in the Gulf of Alaska. AMNWR will contribute some equipment (e.g., radios, rafts and outboard motors, tents) not needed by other projects..

ENVIRONMENTAL COMPLIANCE

The proposed project is a non-intrusive study that relies solely on observations. 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.

PERSONNEL

The project manager and project leader are well qualified to undertake the proposed FY96 study. Brief resumes of these key personnel are provided here.

A. 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 at the University of Idaho in 1989. His thesis, entitled "Seabirds in the Pribilof Islands, Alaska: Trends and monitoring methods", explored statistical procedures for analyzing kittiwake *(Rissa* spp.*)* and murre *(Uria spp.)* population data. 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. Also, he was project manager of the 1993 and 1994 common murre restoration monitoring studies (Projects 93049 and 94039, respectively). Mr. Byrd has authored over 45 scientific papers and 50 U.S. Fish and Wildlife Service reports on field studies, and has made about 20 presentations on seabirds at scientific meetings. Mr. Byrd is the supervisory wildlife biologist at the Alaska Maritime National Wildlife Refuge, the premier seabird nesting area 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.

Byrd, G.V., and J.C. Williams. Whiskered Auklet. 1993. A chapter describing the biology of the species *in* The birds of North America 76 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences of Philadelphia. 12 pp.

Byrd, G.V., and J.C. Williams. Red-legged Kittiwake. 1993. A chapter describing the biology of the species *in* The birds of North America 76 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences of Philadelphia. 12 pp.

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.

B. 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 the numbers and distribution of gyrfalcons, *Falco rusticolus* on the Seward Peninsula, Alaska. He joined the U.S. Fish and Wildlife Service in January 1993 and was project leader of common murre restoration monitoring Projects No. 93049 and 94039 in the Barren Islands during 1993 and 1994. Mr. Roseneau is also principal investigator of the 1995 APEX Barren Islands Sea Bird Study (Project 95163J). 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 at 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. He has broad knowledge of rock climbing techniques and has operated inflatable rafts and other outboard-powered 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 additional hours operating time in small boats 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. During his career, Mr. Roseneau has authored and co-authored 70 reports and publications, including 23 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.

Springer, A.M., D.G. Roseneau, D.S. Lloyd, C.P. McRoy, and E.C. Murphy. 1986. Seabird responses to fluctuating prey availability in the eastern Bering Sea. Marine Ecol. Prog. Ser. 32: 1-12.

Springer, A.M. and D.G. Roseneau. 1985. Copepod-based food webs: auklets and oceanography in the Bering Sea. Marine Ecol. Prog. Ser. 21: 229-237.

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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.

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APRIL 30, 1995

Date Prepared

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Dragoo, D.E., G. V. Byrd, D.G. Roseneau, D.A. Dewhurst, J.A. Cooper, and J.H. McCarthy. 1994. Effects of the T/V *Exxon Valdez* oil spill on murres: A perspective from observations at breeding colonies four years after the spill. Final rept., Restoration Proj. No. 11, U.S. Fish Wildl. Serv., Homer, AK.

ECI (Ecological Consulting, Inc.). 1991. Assessment of direct seabird mortality in Prince William Sound and the western Gulf of Alaska resulting from the *Exxon Valdez* oil spill. Unpubl. rept., Ecol. Consulting, Inc., Portland, OR. 153 pp.

EVOSTC (*Exxon Valdez* Oil Spill Trustee Council). 1994. Invitation to Submit Restoration Projects for Fiscal Year 1995. *Exxon Valdez* Oil Spill Trustee Council, Anchorage, AK. 38 pp.

EVOSTC (*Exxon Valdez* Oil Spill Trustee Council). 1995. Invitation to Submit Restoration Projects for Federal Fiscal 1996 and Draft Restoration Program: FY 96 and Beyond. *Exxon Valdez* Oil Spill Trustee Council, Anchorage, AK. 105 pp.

McCarthy, J.H. and D.A. Dewhurst. 1993. Populations and productivity of seabirds on the Pacific coast of the Becharof National Wildlife Refuge, Alaska, 1992. Unpubl. rept., U. S. Fish Wildl. Serv., King Salmon, AK. 41 pp.

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Piatt, J.F, C.J. Lensink, W. Butler, M. Kendziorek, and D.R. Nysewander. 1990. Immediate impact of the "Exxon Valdez" oil spill on marine birds. Auk 107:387-397.

Roseneau, D.G., A.B. Kettle, and G.V. Byrd. 1995. Common murre restoration monitoring in the Barren Islands, Alaska, 1993. Unpubl. final rept. by the Alaska Maritime National Wildlife Refuge, Homer, Alaska for the *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska (Restoration Project 93049). 82 pp.

1996 EXXON VALDEZ TRUST OUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996						
Personnel		$24.8						
Travel		$2.6						
Contractual		$64.1						
Commodities		$2.0						
Equipment		$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$0.0	$93.5	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration		$8.2						
Project Total	$0.0	$101.7	$125.3	$44.0	$135.5	$138.5	$46.0	$138.5
Full-time Equivalents (FTE)		0.6						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments: Estimated FFY 1997 costs are costs for producing an annual report summarizing results of the FFY 1996 field work.

1996

Prepared: 1 of 4

Project Number:
Project Title: Common Murre Population Monitoring
Agency: DOI-FWS

FORM 3A
AGENCY
PROJECT
DETAIL

4/30/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
	D. Roseneau	Wildlife Biologist	GS 11/4	2.0	4,300		8.6
	G. Byrd	Supervising Biologist	GS 12/4	0.5	5,000		2.5
*	C. Berg	EVOS Coordinator/Program Manager	GS 12/4	0.5	5,000		2.5
	1	Biological Technician (Wildlife)	GS 6/1	2.0	2,200	1,200	5.6
	1	Biological Technician (Wildlife)	GS 6/1	2.0	2,200	1,200	5.6
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		7.0	18,700	2,400	
Those costs associated with program management should be indicated by placement of an *.						Personnel Total	$24.8

Travel Costs:		Ticket	Round	Total	Daily	Proposed
PM	Description	Price	Trips	Days	Per Diem	FFY 1996
	Anchorage, EVOS workshop meetings, 1 traveler	180	2	10	225	2.6
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	[Note: Advance purchace fares were chosen because of possible fare increases.]					0.0
Those costs associated with program management should be indicated by placement of an *.					Travel Total	$2.6

1996

Project Number:
Project Title: Common Murre Population Monitoring
Agency: DOI-FWS

FORM 3B
Personnel
& Travel
DETAIL

4/30/95

1996 EXXON VALDEZ TRUST OUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:	Proposed
Description	FFY 1996
33 days of vessel contract time to suport the population counts (33 days @ $1,850/day = $61,050)	61.0
1 Student Conservation Assoc. volunteer (12 weeks = $3,120)	3.1
When a non-trustee organization is used, the form 4A is required. Contractual Total	$64.1

Commodities Costs:	Proposed
Description	FFY 1996
Fuel and oil for outboard motors (150 gal gasoline @ $1.50/gal = $225; 13 qt oil @ $3/qt = $39)	0.3
Survival supplies (e.g., emergency food, flares, radar reflectors)	0.5
Film (for plot photos)	0.5
Boating supplies (ropes, web straps, shackles, fuel hoses, tarps)	0.4
Field books, tally meters, and maps	0.3
Commodities Total	$2.0

1996

Project Number:
Project Title: Common Murre Population Monitoring
Agency: DOI-FWS

FORM 3B
Contractual & Commodities DETAIL

4/30/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FFY 1996
(None are required)			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency
Inflatable rafts	2	DOI-FWS
Outboard motors	4	DOI-FWS
Binoculars	4	DOI-FWS
Spotting scopes	2	DOI-FWS
35 mm cameras	2	DOI-FWS
Survival suits	4	DOI-FWS
SSB radio	1	DOI-FWS
Hand-held VHF radios	2	DOI-FWS
EPIRBs	2	DOI-FWS

1996

Project Number:
Project Title: Common Murre Population Monitoring
Agency: DOI-FWS

FORM 3B
Equipment
DETAIL

4/30/95

Project Title: Cutthroat Trout and Dolly Varden in Prince William Sound, Alaska: the Relation Among and Within Populations of Anadromous and Resident Forms
"Submitted Under the BAA"

Project Number: 96145-_

Restoration Category: Monitoring and Research

Proposer: USFS, Pacific Northwest Research Station

Lead Trustee Agency: USFS

Cooperating Agencies: Dept. of Fisheries and Wildlife, Oregon State University

Duration: 3 years

Cost FY 96: $336,700.

Cost FY 97: $250,000.

Cost FY 98: $120,000.

Geographic Area: Prince William Sound

Injured Resource/Service: Dolly Varden
Cutthroat Trout

ABSTRACT

Dolly Varden and cutthroat trout are listed as injured resources whose recovery is unknown. Restoration efforts have taken the form of instream habitat modification and stock supplementation. Given that the impact of the oil spill on these fish is unknown at present this approach is conservative. Since the usefulness of this approach in the longterm is unknown, a strategy based on ecological and genetic relations of the affected fish is needed. We are proposing to determine the relation between resident and anadromous forms of these fish within the same watershed and between watersheds in Prince William Sound. We will examine genetic, meristic, and life-history features of each group in FY95 and FY96. Results from this study will allow a longterm, comprehensive and ecologically sound restoration strategy for these fish to be developed.

INTRODUCTION

NEED FOR THE PROJECT

Dolly Varden (*Salvelinus malma*) and cutthroat trout (*Oncorhynchus clarki*) are important ecological and recreational resources in Prince William Sound. Populations of each species are found throughout

Prince William Sound (Mills 1988). There are resident and anadromous (i.e. sea-going) forms of each species. Anadromous individuals spend varying amounts of time in freshwater (up to 4 years) before going to the marine environment (Scott and Crossman 1979). There, both species feed in nearshore and estuary areas (Scott and Crossman 1979, Morrow 1980). Dolly Varden feed on crustaceans, small invertebrates, and fish (Armstrong 1971) and cutthroat feed on fish (Narver and Dahlberg 1965).

Areas used by these fish were impacted by petrogenic hydrocarbons from the *Exxon Valdez* oil spill. Benthic organisms in nearshore areas are particularly susceptible to petrogenic hydrocarbons (Teal and Howarth 1984). In Prince William Sound, the size of epifauna and numbers of amphipods, which are food sources for Dolly Varden, decreased in areas exposed to the spill (Jewett and Dean 1993, Jewett et al.1993). Hepler et al. (1993) found that Dolly Varden and cutthroat trout populations in oiled areas had slower growth rates compared to populations in unoiled streams from 1989 to 1990, the year of the spill. A similar pattern was observed for cutthroat trout in 1990 to 1991. However, growth rates of Dolly Varden in oiled areas did not differ from those in unoiled areas during that period (Hepler et al. 1993). Survival rates for each species from 1989 to 1990 were less in oil impacted areas than in unimpacted areas (Hepler et al. 1993). Hepler et al. (1993) hypothesized that chronic starvation and/or direct exposure to petrogenic hydrocarbons were responsible for the differences in growth and survival of the species in oiled and unoiled areas. The *Exxon Valdez* Oil Spill (EVOS) Trustee Council officially lists these species as injured resources whose recovery is unknown.

B. Rationale

Reduced growth and survival rates could have long-term impacts on populations of Dolly Varden and cutthroat trout in areas exposed to oil. These species may live up to 8 years (Morrow 1980) and the expected persistence of oil in the nearshore environment (Lee et al. 1979) suggests the potential exists for long-term impacts to these species. Decreased survival would have obvious population implications. The extent would depend on population size; smaller populations would be most susceptible to eventual extinction (Rieman et al. 1993). There may be less obvious impacts also. The potential for loss of genetic variability, which is needed for long term adaptation, increases as population size decreases (Nelson and Soule 1987). Reduced growth rates of individuals can lead to increased susceptibility to mortality and decreased reproductive potential (Adams 1990). If any of these impacts were to occur for extended periods, even at low levels, affected populations would face increased probability of extinction.

A course of action to reduce the probability of loss of populations in areas impacted by the oil spill was initiated in FY92. The focus of this recovery efforts was on opening up new areas for rearing and population supplementation. Between FY92 and FY95, $173,000 was expended on these efforts. Monitoring the effectiveness of some of these actions is proposed for FY96-98.

The EVOS Trustee Council calls for an ecosystem approach to restoration. Specifically, they say that restoration "will take an ecosystem approach to better understand what factors control the populations of injured resources" (*Exxon Valdez* Restoration Plan). We define ecosystems in a general sense to include the physical and biological factors that influence a population of organisms. This can include members of its own species as well as other species. Thus, understanding the interaction or potential interaction between and among populations of a species can provide valuable information on developing effective restoration programs.

Collections of interacting populations of the same species can be termed a metapopulation (Shaffer 1987, Hanski and Gilpin 1991). Features of such populations include local populations that are more likely to interbreed and interact among themselves than with other groups, but exchange of individuals occurs through various dispersal mechanisms. There may be local extirpation of populations as a consequence of catastrophic events. Surrounding populations then serve as sources of individuals for recolonization and recovery of impacted populations (Brown and Kodric-Brown 1977, Sjogren 1991). The dynamics of metapopulations are particularly important to the persistence and recovery of populations following catastrophic events (Yount and Niemi 1990).

Metapopulation dynamics are an important consideration in the development of conservation and restoration programs (Murphy and Noon 1992, Noon and McKelvy 1992). Restoration strategies for a metapopulation would differ from those for single populations in regards to such features as recolonization potentials, time to recovery, etc. Importantly, a recovery strategy that considers metapopulations may require less investment of resources than that required for single populations.

Many salmonid populations exist as part of metapopulations. Homing and fidelity to spawning and nursery areas results in some isolation of populations (Ricker 1972). Local adaptations provide further isolation. Dispersal among groups may be maintained through straying of migrating adults (Simon 1972, Labell 1992), density displacement of individuals (McMahon and Tash 1988, Northcote 1992), or maintenance of pioneering or colonizing phenotypes (Northcote 1992).

Results of this study will provide the foundation for the development of proactive, ecologically based restoration strategies and provide valuable information for management of these species in Prince William Sound. Knowledge about the relation of resident and anadromous forms within the same watershed will provide insight into the potential response of a population to any long-term negative impacts of the exposure to oil. For example, if resident forms of a species contribute to the anadromous forms then there may be a buffer against potential long-term declines of anadromous forms. In such a case, the most prudent restoration activity may be to protect these resident populations and their habitat in streams with populations exposed to the oil spill. Knowledge about the relation among populations of each species will provide additional insight into the potential long-term impacts of exposure to oil. If the populations are a metapopulation, any long-term impacts on a population segment could possibly be mitigated by recruitment from other population segments. Conversely, if the populations are unique this indicates that there is little exchange with nearby populations. Consequently, the ability of surrounding populations to aid a declining population would be reduced. Mitigation measures focused on individual populations would be required in such a case.

Knowledge of the range of diversity within and among populations of each species within Prince William Sound will aid in the development of general management policies and decisions.

C. Summary of Major Hypothesis and Objectives

The objectives of this proposed study are to:

1. Determine for both Dolly Varden and cutthroat trout whether anadromous and resident forms in the same watershed are part of one population or different populations.
2. Determine for both Dolly Varden and cutthroat trout whether spawning aggregations in different streams in Prince William Sound are part of one population or different populations of a

metapopulation.

3. Develop a restoration strategy for Dolly Varden and cutthroat trout based on the results of this study.

We will test the following hypotheses:

1. Resident and anadromous forms of each species from a watershed will exhibit similar genetic and meristic features.

   Corollaries

   1.1 Similarities will be strongest in watersheds where resident forms have been isolated the least amount of time.

   1.2 Similarities will be strongest in watersheds where isolating barriers allow a flow of individuals from the resident to the anadromous populations.

2. Populations of each species in Prince William Sound will exhibit similar genetic and meristic features and can be considered a metapopulation.

In FY96 we propose to identify 8-10 populations of each species in streams distributed throughout Prince William Sound and in areas impacted and not impacted by the oil spill. We will collect individuals from each population for analysis of genetic, meristic (i.e. anatomical), and life-history features. Sampling of these sites will be repeated in FY97.

D. Completion Date

This project is scheduled to be completed in FY98. At that time, we will provide information on the relations of populations within the same watershed and among populations that will provide the foundation for a prudent recovery program for Dolly Varden and Cutthroat Trout in Prince William Sound impacted by the oil spill.

E. COMMUNITY INVOLVEMENT

We will hire 2 people to help with field work and will charter planes and boats for transport to field locations in FY96. We will operate out of Cordova, AK.

FY 96 BUDGET

Personnel	80.1
Travel	32.1
Contractual	196.1
Commodities	1.2
Equipment	1.5
Subtotal	311.0
Gen. Admin.	25.7
Total	336.7

PROJECT DESIGN

A. Objectives

1. Determine for both Dolly Varden and cutthroat trout whether anadromous and resident forms in the same watershed are part of one population or different populations.

2. Determine for both Dolly Varden and cutthroat trout whether spawning aggregations in different streams in Prince William Sound are part of one population or different populations of a metapopulation.

3. Develop a restoration strategy for Dolly Varden and cutthroat trout based on the results of this study.

Figure 1 illustrates the relation among the objectives.

B. Methods

We will test the following hypotheses:

1. Resident and anadromous forms of each species from a watershed will exhibit similar genetic and meristic features.
   Corollaries
   1.1 Similarities will be strongest in watersheds where resident forms have been isolated the least amount of time.
   1.2 Similarities will be strongest in watersheds where isolating barriers allow a flow of individuals from the resident to the anadromous populations.

2. Populations of each species in Prince William sound will exhibit similar genetic and meristic features and can be considered a metapopulation.

We propose to sample 10 streams distributed across Prince William Sound that contain resident and anadromous forms of Dolly Varden and cutthroat trout. Five sites will be in areas impacted by the oil spill and 5 in unoiled areas. Exact field locations have not been identified at this time. We have contacted ADFG and asked for a tentative list of sites. We have also contacted USFS fish biologist requesting similar information. Final selection of sites will be based primarily on population size and the ability of the population to provide a sufficient sample.

We will collect 40 individuals, representing the size distribution of individuals (adult and juveniles) found of the population, from the resident and anadromous populations in each stream. Each species will be sampled during their respective spawning periods, spring for cutthroat trout and fall for Dolly Varden. Collection of each species at spawning should insure that individuals are members of a single population rather than a collection from different populations. Fish will be collected by various techniques, including baited minnow traps, seining, and hook and line. Captured fish will be weighed and measured, have appropriate tissues removed, given an identification number, and frozen immediately on dry ice. Meristic analysis will be conducted in the laboratory. Otoliths will be removed and prepared for microchemistry analysis in the laboratory.

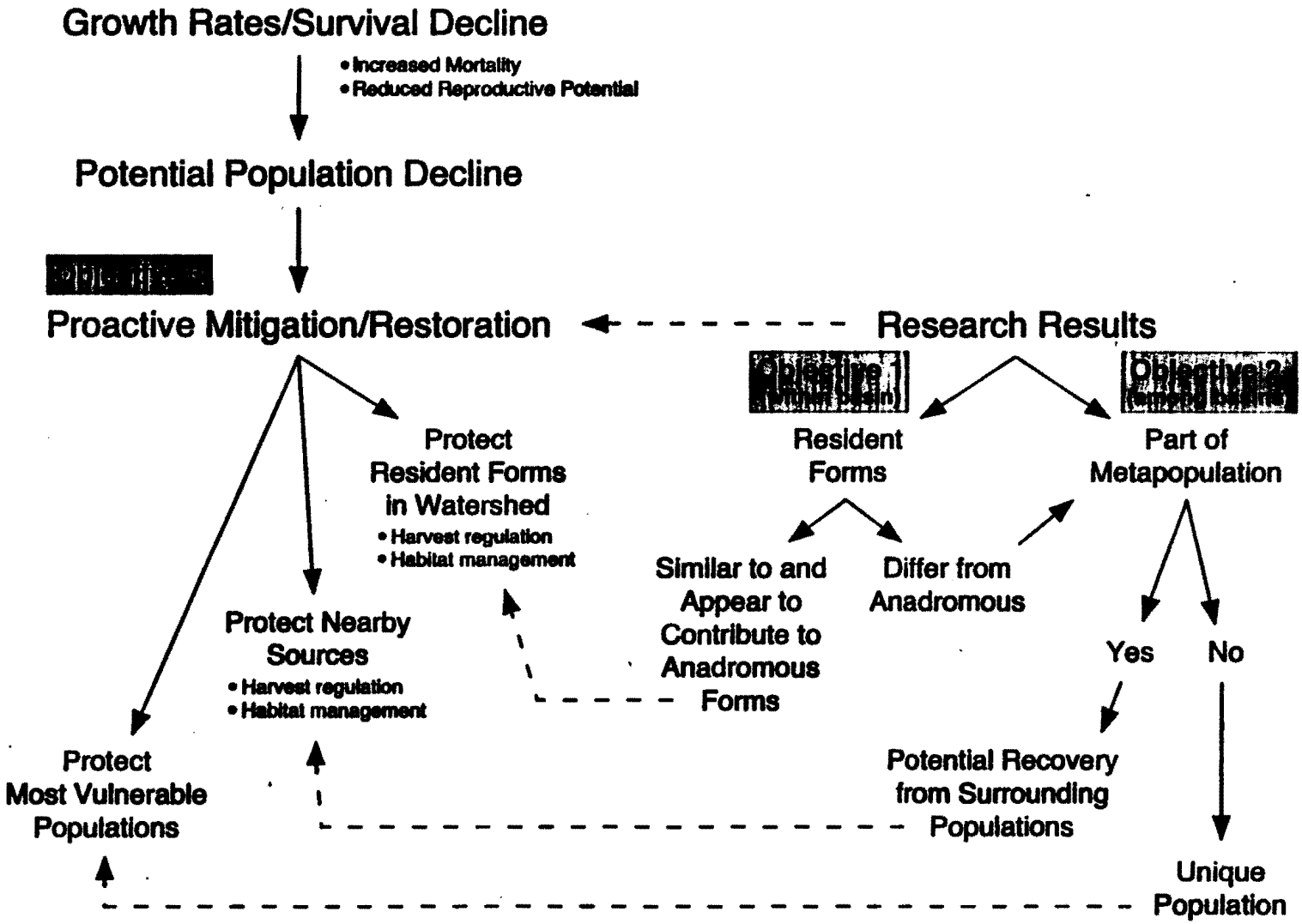

Figure 1. Flow diagram of possible research outcomes and feedback to mitigation and restoration.

We will examine molecular genetic, morphological, and life history variation in resident and anadromous Dolly Varden and cutthroat trout in Prince William Sound using four different techniques: 1) protein electrophoresis; 2) mitochondrial DNA or microsatellite DNA markers; 3) meristic variation; and 4) otolith microchemistry. Each technique has unique advantages for this study.

Very little genetic information is available in the peer-reviewed literature on Dolly Varden in western North America. Consequently, of the three genetic techniques we proposed to use, we will focus on two each in different years. The use of two different techniques will allow independent tests of our hypotheses and maximize the amount of information we can provide. We intend to use protein electrophoresis and one of the two DNA techniques, after we have evaluated their usefulness.

Protein electrophoresis is a reliable, inexpensive, rapid technique for examining geographical or temporal genetic variation in salmonids. It uses the differential migration of different forms of an enzyme encoded by a locus (allozyme) in an electrical field to identify different alleles. Genotype and allelic proportions inferred from different allozymes in different samples can be used to test for nonrandom patterns of variation. However, it may not be precise enough to detect differences among lif-history forms or closely related populations.

We propose to examine genetic variation at approximately 60 loci. The most complete information is available from examining allozymes in many different tissues (eye, heart, liver, muscle). However, this requires sacrificing the fish. Samples sizes will consist of about 80 fish (40 resident and 40 anadromous) from each of 10 locations A limited set of loci can also be examined using fin tissue, which can be removed on larger fish without sacrificing them.

We are using this technique currently to examine, in part, the relations of populations of coastal cutthroat trout throughout their distributional range, Prince William Sound to northern California. We have samples from one population in Prince William Sound, Boswell Bay on Hitchenbrook Island. We will use this as one of the unoiled sites in the proposed study. We also have samples from cutthroat trout populations in nearby areas, Martin River on the Copper River Delta and the Gines Creek, near Yakutat. These populations will serve as outgroups for this study. K. Hepler, ADFG in Anchorage, has offered to provide Dolly Varden from a Kodiak Island population as an outgroup for Dolly Varden. Outgroups are samples that we expect to be genetically distinct from the study populations because they are usually selected from geographically distant populations. The genetic divergence of the study populations from the outgroup provides a relative scale for the genetic differences observed in the study populations.

We have also used protein electrophoresis to examine the relation between resident and anadromous forms of cutthroat trout in a basin in southeast Alaska and in southern Oregon (K. Griswold, unpublished data). Differences among groups were sufficiently large to allow the use of this technique. Preliminary results are shown in Fig. 2. This analysis suggests two distinctive patterns of genetic variation among populations and potential relations between the two forms. There was little genetic variation in sampling locations above and below a barrier in Vixen Inlet in Southeast Alaska (Fig. 2a). The two above barrier locations, Larry's Creek and Second Tributary, were more similar to one another than the samples collected immediately above and below a geologic barrier. These results suggest that the groups have not been isolated long enough to have undergone divergence or that the above barrier populations may be contributing to the anadromous populations.

Figure 2

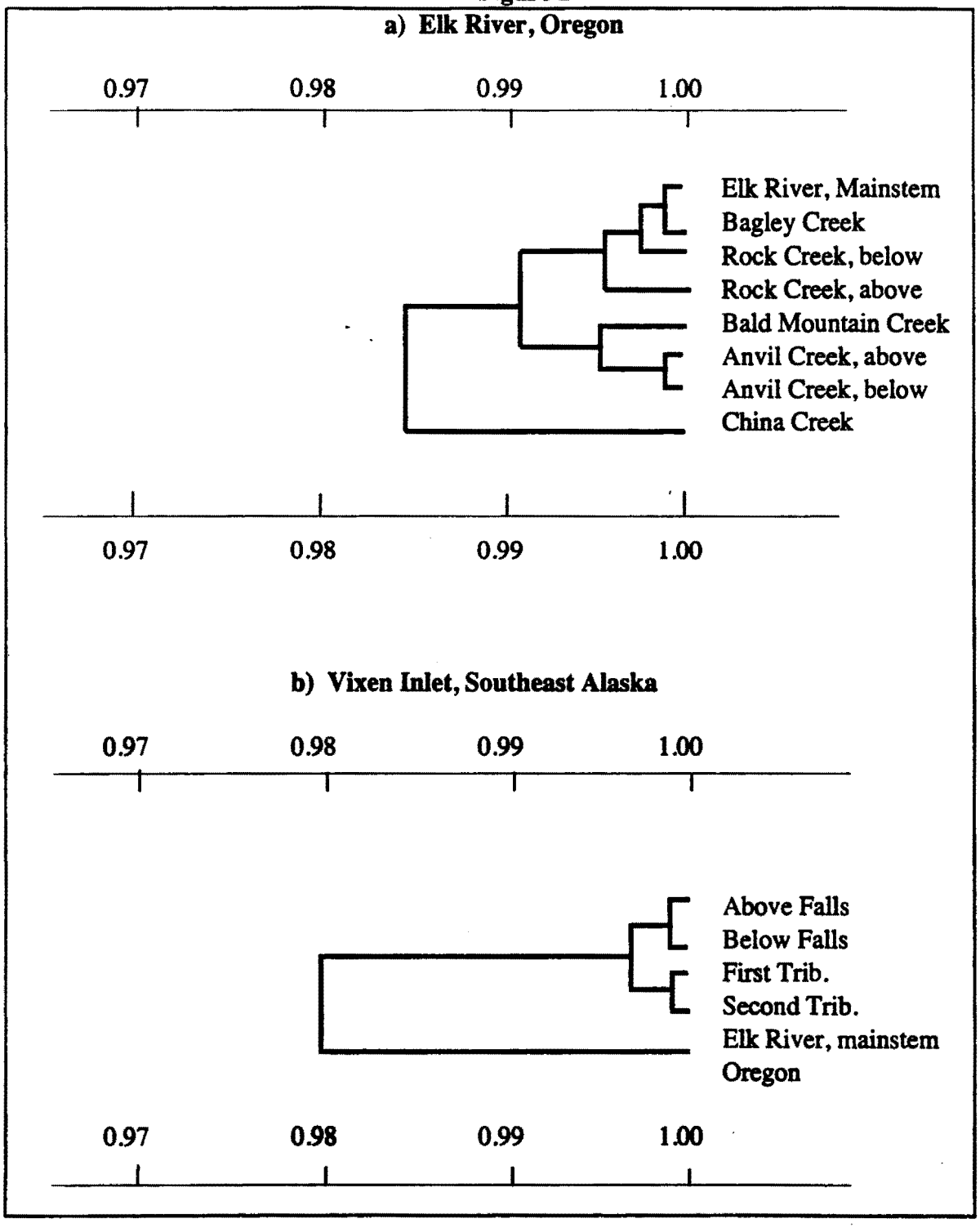

Figure 2a, b. Cluster analysis using unweighted pair group method, based on Nei's genetic similarity. Figure 2a displays the high level of diversity among populations in the Elk River. Figure 2b represents the low genetic variation in Vixen Inlet. Elk River mainstem samples were included as an outgroup.

In the Elk River in Oregon, there was a higher degree of genetic variation among eight sampling locations above and below geologic barriers (Fig. 2b). China Creek is separated from the mainstem of the Elk River by a 4 meter waterfall and was genetically distinct from all other Elk River samples. These results imply that coastal cutthroat trout in China Creek have been isolated from all other Elk River populations long enough for the population to undergo genetic divergence. In contrast to these results, the above and below populations in Anvil Creek show little genetic divergence and there are no statistical differences between the two sites. In this case, either the populations have not been isolated long enough for there to be significant genetic differentiation or the above barrier population is contributing to the below barrier population. These results highlight the varying patterns in genetic variation that can be detected within basins using protein electrophoresis. They also suggest that the relation between resident and anadromous forms depend on local conditions.

Knowledge of this relation between the resident and anadromous forms will be an integral component of any restoration program. Figure 1 illustrates how this information could be used in developing a restoration program for Dolly Varden and cutthroat trout in Prince William Sound.

Although allozyme variation is usually treated as having no selective advantage in population studies, under some conditions, it may be associated with physiological or morphological components of fitness, such as enhanced growth, fecundity, survivorship, and developmental rate and stability (Mitton and Grant 1984, Vrijenhoek 1985, Allendorf and Leary 1986, Zouros and Foltz 1987, Quatro and Vrijenhoek 1989). Where it is possible to appropriately measure altered patterns of growth, fecundity, or developmental instability as might be caused by exposure to strong environmental stressors - such as oil spills - allozyme variation may also show correlated changes in enzyme heterozygosity.

Many different classes of DNA polymorphisms are available for population genetic studies. We propose to examine two different classes of DNA markers for levels of appropriate variation during the first year of the project and to choose one to use for the remainder of the project. The two kinds of DNA markers we will examine are 1) mitochondrial DNA (mtDNA) polymorphisms and 2) microsatellite DNA polymorphisms. Mitochondrial DNA variation can potentially show greater genetic structure among populations than allozyme variation, because the mitochondrial genome in vertebrates may evolve more rapidly than many nuclear genes and it is maternally inherited without recombination (Brown et al. 1979, Avise 1986). Analysis of mtDNA is especially appropriate for studying maternal lineages. It uses very little tissue, and consequently, does not require sacrificing fish. In general, DNA techniques provide a greater probability of detecting differences between life-history forms or closely related populations than does protein electrophoresis. However, it is more expensive than protein electrophoresis. We have used it successfully in our laboratory to study geographical genetic differences in rainbow trout (*O. mykiss*), chinook salmon (*O. tshawytscha*), and coho salmon (*O. kisutch*).

For this study, we would initially examine the variation in three fragments of the mtDNA genome in a broad geographical sample of Dolly Varden and cutthroat trout by amplifying them using the polymerase chain reaction (PCR) following methods of Cronin et al. (1993) and using primers developed by LGL Genetics, Inc. (1410 Cavitt St., Bryan, TX 77801). We would screen for polymorphisms in each fragment digesting the fragment with 30 different restriction enzyme and examining ethidium bromide stained fragment patterns under ultraviolet light. The most variable mtDNA fragment-restriction enzyme combinations would be selected for more detailed population surveys. This allows us to maximize the amount of useful information we can obtain.

The other kind of marker, microsatellite DNA polymorphisms, is based on variation in the number of short tandem repeats in nuclear DNA of a core DNA sequence of 2-6 nucleotide based pairs. Because microsatellite loci mutate 3-5 times faster than mtDNA or some nuclear DNA, it is a potentially powerful tool for examining the relationships between individuals within populations and between populations. Like mtDNA, microsatellites can be amplified using small amounts DNA in a PCR reaction and the different alleles can be seen directly by electrophoretic separation on an autoradiogram. However, the technique is only now beginning to be used in salmon and chars, and must be considered unproven.

However, because of its potential power for examining differences among resident and anadromous fishes within populations or between populations, we propose analyzing 8-10 microsatellite loci on the same fish used for screening mtDNA variation. Primers will be obtained from other laboratories (Dalhausie University, University of California, Davis, and others) and from the published literature (Estoup et al. 1993, Sakamoto et al. 1994). We will compare the power, reliability, and efficiency of the mtDNA and microsatellite DNA techniques and choose one to complete our study of Dolly Varden and cutthroat trout in Prince William Sound. Estimates of appropriate sample sizes will be calculated for the desired power based on the variability we detect.

Meristic data are based on counts of body parts. Meristic variation reflects both genetic and environmental variation, although the relative contribution of the genetic component is high (Leary et al. 1985a). Analysis of meristic variation has two uses. First, when patterns of geographical meristic variation covary among samples with allozyme or DNA variation, they provide supporting evidence of genetic differentiation among populations or groups of populations. Second, fluctuating asymmetry in meristic traits - the unpredictable differences in a trait between the left and right side of the fish - may be a sensitive indicator of environmental stress or loss of genetic diversity within a population (Leary et al. 1984, 1985a,b).

Individuals for meristic analysis will be randomly selected from collections of each group at a sampling location, preserved in 10% formalin, and stored in 40% isopropanol. Meristic data will be collected on 11 meristic characters: 1) scales above the lateral line (scale rows); 2) scales in the lateral series; 3) proximal pterygiophores of the dorsal fin; 4) proximal pterygiophores of the anal fin; 5) left and right pelvic fin rays; 6) left and right pectoral fin rays; 7) left and right branchiostegal rays; 8) gill rakers on the upper limb of the first, left gill arch; 9) gill rakers on the lower limb of the first, left and right gill arch; 10) pyloric caeca; 11) vertebrae; and 12) left and right mandibular pores. Two measures of asymmetry will be calculated on the pair counts: the number of asymmetrical characters per individual and total asymmetry (Leary et al. 1984, 1985a,b).

The hypothesis that each collection was drawn from a single, randomly mating group, under assumptions of Hardy-Weinberg equilibrium, will be tested for allozyme and microsatellite genotype data using a log likelihood ratio test (G-test). Interaction between loci, or gametic disequilibrium (Waples and Smouse 1990) will also be calculated. Significance levels for all tests will be adjusted for multiple comparisons (Cooper 1968). Average heterozygosity (percent variation at a locus) will be calculated for each locus using Hardy-Weinberg expectations and averaged over all loci.

Genetic differences within and among populations will be examined using a nested G-test of allelic variation within and among tributaries. Unplanned geographical comparisons, based on hierarchical clustering of fish from different locations by similarity of allele frequencies or mtDNA haplotype, will be

examined by G-tests or Chi-square tests (X^2). Because sample sizes for allele or mtDNA haplotype frequencies may be small enough to expect departures from known X^2 distributions in some groups, X^2 analyses will be examined by a Monte Carlo procedure using 1000 randomizations (Roff and Bentzen 1989).

Meristic differences among all possible pairs of samples, among genetically similar groups identified by cluster analysis of allozyme, microsatellite or mtDNA variation, and among different life histories will be examined by analysis of variance (ANOVA) or multivariate analysis of variance (MANOVA).

Patterns of geographical genetic similarity used for unplanned comparisons will be identified by constructing phenograms from cluster analyses of pair-wise estimates of divergence between samples, using the unweighted pair-group method with arithmetic averages (UPGMA) algorithm (Sneath and Sokal 1973). Nei's genetic distance (Nei 1972, 1978), which estimates the number of codon substitutions that have occurred between two populations, and Nei's nucleotide diversity (Nei 1987), which estimates the average number of nucleotide substitutions between DNA haplotypes in two different populations, may be used as measures of genetic differentiation between populations for the allele and mtDNA data, respectively.

Otoliths provide a record of an individual fish's life history. Otoliths are composed of calcium carbonate and other trace elements and are formed by the successive growth of concentric rings around dense primordia. Wave-length dispersive electron microprobe sampling can be used to detect proportions of trace elements in low concentrations in otoliths and can thus provide an environmental history of an individual associated with age and growth (Radtke 1989, Gunn et al 1992). Strontium is freely substituted for calcium during calcium carbonate deposition in bones in proportion to its concentration in the environment. Marine environments have elevated Sr/Ca ratios relative to most freshwater environments. Higher Sr/Ca ratios leave a detectable signature on the otolith which can reflect the movement of an individual from freshwater to saltwater (Kalish 1990). Primordia are deposited from maternally derived nutrients (yolk sac) and reflect the maternal environment during egg development (Kalish 1990). Researchers have been successful in discriminating the origin of resident and anadromous sockeye salmon (*O. nerka*) (Rieman et al. 1994) and brown trout (*Salmo trutta*) (Kalish 1990) in controlled experiments.

Analysis of both coastal cutthroat trout and Dolly Varden otoliths suggest that electron microprobe techniques could provide significant insight to the life history and migration history of these species. Elemental analysis using electron microprobe technology was undertaken for both Dolly Varden from Alaska and coastal cutthroat trout from Oregon. Each otolith was sampled with a transect taken from the primordia to the otolith edge. This allows for reconstruction of the environmental history of the individual from emergence to the point of collection. Preliminary results of this analysis for Dolly Varden from Auke Bay, Alaska suggest that there are two distinctive migration patterns within this population. Initial high levels of Sr/Ca ratios, which are sustained throughout the life history, suggest that the individual moves into saltwater at an early age (Figure 3a). An alternative pattern wherein the Sr/Ca ratios are low followed by a sharp peak suggests that the individual remained in freshwater for an extended period of time and entry into a marine environment was delayed. Preliminary analysis of otoliths from the Elk River, in southern Oregon, shows similar patterns of variation among individuals collected from the mainstem (Figure 3b). Results of transect analysis of otoliths from coastal cutthroat trout from Vixen Inlet, Southeast Alaska suggest that movement into freshwater was

Figure 3

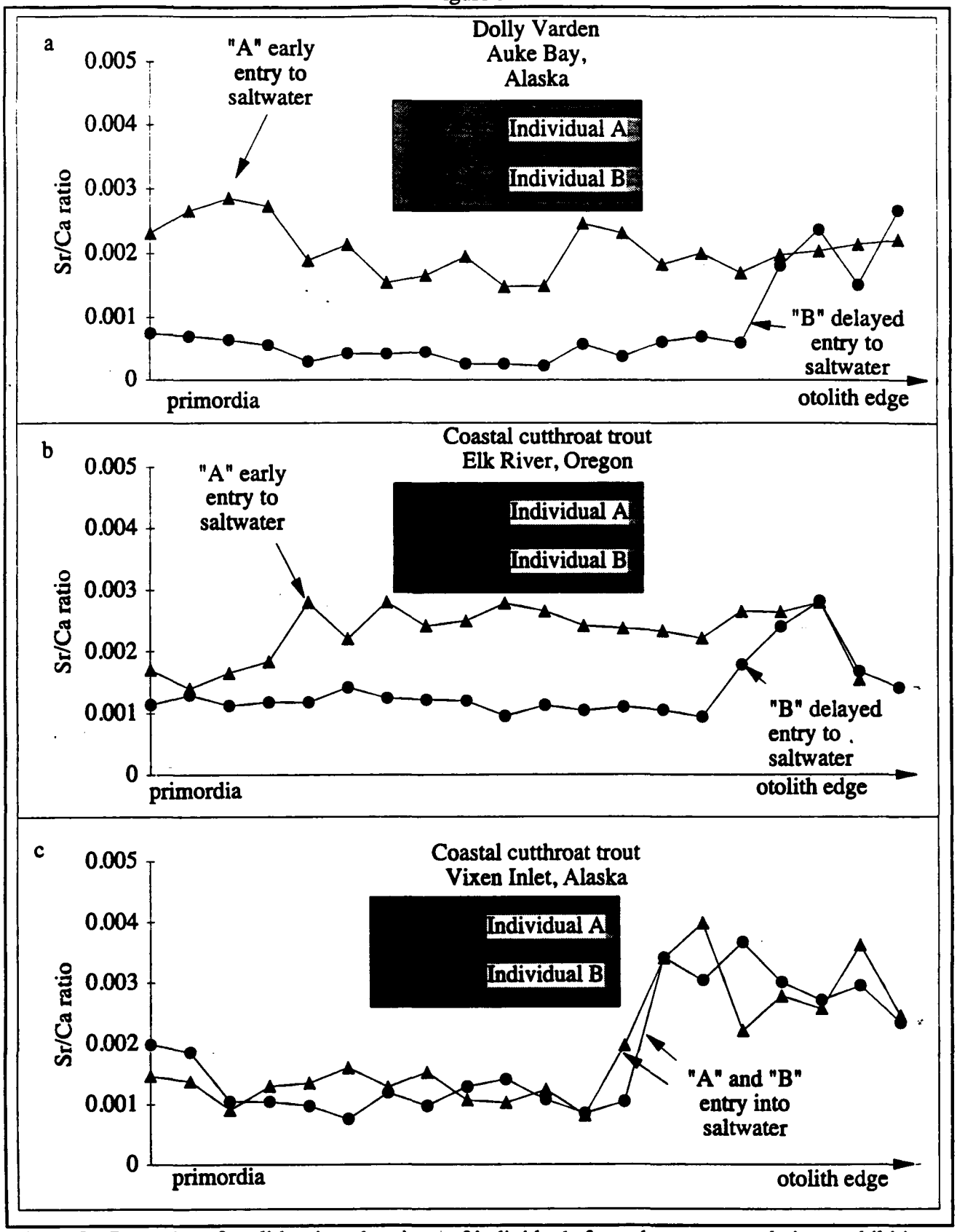

Figure 3. Examples of otolith microchemistry of individuals from the same populations exhibiting different life history patterns. The lines represent transects from the primordia to the edge of otoliths. Elevated Sr/Ca ratios suggest entry into a marine environment. See text for further details.

delayed (Figure 3c).

Otolith microchemistry analysis provides a powerful tool to reconstruct detailed life history information, potentially including origin of the maternal parent. A low Sr/Ca ratio in the otolith suggests the maternal parent was a resident fish. A high ratio would suggest the maternal parent was anadromous (Fig. 2a). Rieman et al. (1994) used the technique to identify the maternal parent of sockeye salmon smolts migrating from Redfish Lake, Idaho.

Further elemental analysis of Dolly Varden and cutthroat trout otoliths in conjunction with genetic analysis can contribute to the understanding of relationships among populations within the Prince William Sound and ultimately their management and recovery. For instance, within a population that contain two distinctive patterns in age first seaward migration comparisons of the genetic relationship of the two groups can also be made. If, for example, it is found that the groups are genetically distinct as well as possessing unique life history characteristics special attention would have to be focused on each segment of the population to ensure the persistence of the populations in the long-term.

C. Contracts and Other Agency Assistance

We will contract with individuals and companies for transportation to and from field sites and for assistance with field work. Because sites will be dispersed throughout Prince William Sound we will need to reach them by float plane or boat. The window of opportunity for sampling will be constrained by the time individuals are on the spawning grounds and weather conditions. We will require assistance with collection of fish. These will be short-term needs that can be met with people in the local community. We will contract with individuals for this help.

We will establish a cooperative agreement with the Oregon Fishery Cooperative Unit, Dept. of Fisheries and Wildlife, Oregon State University (OSU), Corvallis, OR for the genetic and otolith microchemistry analysis. We will pursue this avenue to save overhead costs. If the EVOS Trustee Council were to contract the grant directly to the university, overhead would be approximately 40%. The USFS has a cooperative agreement with the university that charges 8% for overhead. The genetic laboratory at OSU has been involved in numerous studies involving a variety of salmonids for more 25 years. They have done a number studies on cutthroat trout, including populations in Alaska. The lab has done some work on bull trout (*S. confluentus*), a species closely related to Dolly Varden. This lab is also one of the few labs that is capable of conducting a comprehensive examination of all aspects of genetics, allozymes and DNA, and meristics.

The analysis of the otolith microchemistry will also be part of the cooperative agreement with OSU. OSU has one of the only facilities available to do this analysis. The USFS will be responsible for preparing the otoliths for analysis and for data analysis. OSU will run the samples and provide the raw data.

D. Location

This study will examine sites, in yet to be determined locations, located throughout Prince William

Sound. We will quarter out of Cordova for field collections. This will provide a central location, has good facilities, and allows us access to additional field equipment and persons with knowledge of streams in Prince William Sound.

The benefit of this project should be the sustained longterm production of Dolly Varden and cutthroat trout populations in Prince William Sound. The benefit should be realized by individuals and communities throughout Prince William Sound and by individuals from other areas that use these populations for recreation and subsistence.

SCHEDULE

A. Measurable Project Tasks for FY96

October:	Develop cooperative agreement with OSU
	Contact ADFG and USFS to assemble list of potential study sites
	Secure appropriate collecting permits from ADFG
	Obtain samples of Dolly Varden and cutthroat trout for preliminary genetic, meristic, and otolith microchemistry analysis
	Hire technician for genetic analysis
November - December:	Continue genetic screening
	Reduce list of field sites
	Initiate search for contract vessel
	Hire field technician
	Arrange for otolith microchemistry analysis
January - February 1996:	Complete genetic screening
	Select field sites
	Attend annual workshop
	Identify people (2) to hire in Cordova for field work
	Secure contract vessel
March:	Assemble required field gear and ship to Cordova
April- May:	Contract with people (2) for field work now and in fall
	Collect samples of cutthroat trout at field sites
	Begin genetic, meristic, and otolith microchemistry analysis
June - August:	Continue genetic, meristic, and otolith microchemistry analysis
September:	Collect samples of Dolly Varden at field sites
	Initial analysis of genetic data on cutthroat trout populations
	Prepare progress report

B. Project Milestones and Endpoints

Objectives 1 and 2 will be met by the latter part of FY98, following complete analysis of the genetic, meristic, and otolith microchemistry. Objective 3, development of a restoration strategy, will be met by the end of FY98.

Major tasks and dates over the projected duration of the study are as follows:

March 1997:	Prepare report on preliminary analysis of genetic, meristic, and otolith microchemistry from FY96
	Make possible adjustments in sampling and analysis procedures
March 1998:	Prepare report on preliminary analysis of genetic, meristic, and otolith microchemistry from FY96 and FY97
January 1999:	Report final results and articulation of restoration strategy
	Submit papers on results to peer-reviewed journals

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

We have contacted ADFG and USFS in regards to identification of sampling sites and possible assistance with collection of fish. ADFG has offered to provide Dolly Varden from Kodiak Island as an outgroup (see discussion of these fish on page 7). We have tentative plans to work with the USFS, Cordova Ranger District, in September, 1995 to visit possible study sites if we receive the grant. We have also made tentative arrangements with the USFS, Cordova Ranger District, for use of boats and other equipment. We will also consult with geneticists from ADFG on information and assistance that they could provide. We have been in touch with this group in connection with an on-going study of cutthroat trout in other parts of Alaska. ADFG has focused on commercial salmon and have no study comparable to that being proposed at present.

The scope and nature of this study falls within the range of those conducted by USFS Research. Such studies provide the USFS with information necessary to design management policies and plans for maintaining biodiversity of populations on lands that it manages.

ENVIRONMENTAL COMPLIANCE

To our knowledge, the only permit required for this study will be a collecting permit for fish from ADFG. We currently have a permit to collect cutthroat trout from other parts of Alaska. We will explore the possibility of modifying this existing permit to meet our needs for this study. There should be no federal or local environmental laws and regulations the need to be complied with.

PERSONNEL

The core personnel for this proposal are eminently qualified to implement this project. Gordon H. Reeves, Co-principal Investigator, is a research fish biologist with the USFS, Pacific Northwest Research Station, Corvallis, OR. He has been in that capacity for 10 years and has worked on anadromous salmonids research in streams throughout the Pacific Northwest and southeast Alaska. He has been involved with the development of conservation and restoration for anadromous salmonids in the Pacific Northwest. He is currently directing a study that is determining the relation of coastal cutthroat trout populations throughout their distributional range. He has published several articles on the ecology of anadromous salmonids and their freshwater habitat in peer-reviewed journals.

Kenneth P. Currens, the other Co-principal Investigator, is the Genetics Program Leader, Oregon Cooperative Fishery Research Unit, Dept. of Fisheries and Wildlife, Oregon State University. He has been in that capacity since 1992. He has been involved in numerous studies examining allozymes, DNA, morphological, and genetic breeding studies of Pacific salmon, including cutthroat trout. He has advised and coordinated with state, federal, and tribal fishery agencies on genetic risk assessment. He has published several articles on genetics of salmon and trout in the peer-reviewed literature. Currens is currently supervising the genetic analysis of a study that is determining the relation of coastal cutthroat trout populations throughout their distributional range.

Kitty Griswold is a fish biologist at the USFS, Pacific Northwest Research Station, Corvallis, OR. She will be the research assistant on this project. She will supervise field work and be responsible for the otolith microchemistry analysis. She is currently completing a study examining the relation between resident and anadromous cutthroat trout in watersheds in Alaska and in Oregon.

Brief resumes for each of these individuals follow.

GORDON H. REEVES
USDA Forest Service, Pacific Northwest Research Station, Oregon State University, Corvallis, OR 97331.

Education:
B.A. - Biology, State University of New York, Oswego. 1973.
M.S. - Fisheries Science, Humboldt State University. 1978.
Ph.D. - Fisheries Science, Oregon State University. 1985.

Experience:
Assistant Professor, Department of Fisheries and Wildlife, Oregon State University. 1987 to present.
Courtesy Assistant Professor, Department of Fisheries. Humboldt State University. 1986 to present.
Research Fishery Biologist, USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 1986 to present.
Commercial Fisherman, Trinidad , California. 1978-79.
Research Biologist, New York State Research Foundation. State University of New York, Oswego. 1973-1976.

Professional Societies:
American Fisheries Society, North American Benthological Society. Sigma Xi National Honor Society

Professional Activities:
President, Oregon Chapter of the American Fisheries Society. 1989.
President-elect, Oregon Chapter of the American Fisheries Society. 1988.

Honors and Awards:
Certificate of Merit, USDA Forest Service. 1984
Certificate of Merit and Quality Step Increase, USDA Forest Service. 1986, 1989, and 1994.

Ethics in Science Award, USDA Forest Service. 1989.

Oldfield Team Award, College of Agriculture, Oregon State University. Award given for outstanding research by the Stream Team. 1991.

USDA Forest Service Rise to the Future Award for outstanding contributions in fishery research. 1991.

Conservationist of the Year Award, Pacific Rivers Council. 1992 and 1994.

Special Assignments

Member Scientific Panel on Late-Successional Forest Ecosystem - formed by the Agriculture Committee and the Merchant Marine and Fisheries Committee of the U.S. House of Representatives to develop and evaluate alternatives for managing and conserving late-successional forest and aquatic ecosystems on federal lands in northern California and western Oregon and Washington. 1991.

Co-Leader PacFish Team - responsible for developing and evaluating alternatives for managing freshwater habitat of anadromous salmonids on federal lands in northern California, Oregon, Washington, Idaho, and Alaska. 1992-1993.

Member Scientific Assessment Team - develop management strategy for maintaining biodiversity of federal lands in northern California and western Oregon and Washington at request of U.S. Federal Circuit Court Judge. 1992.

Co-leader of Aquatic Group of Forest Ecosystem Management and Assessment Team -responsible for developing and evaluating alternatives for managing federal lands in northern California and western Oregon and Washington. 1993.

Selected Publications

Reeves, G. H., F. H. Everest, and J. D. Hall. 1987. Influence of water temperature on interactions between the redside shiner (*Richardsonius balteatus*) and the steelhead trout (*Salmo gairdneri*). Canadian Journal of Fisheries and Aquatic Sciences 44:1603-1613.

Hankin, D. G. and G. H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of Fisheries and Aquatic Sciences 45:833-844.

Dolloff, C. A. and G. H. Reeves. 1990. Microhabitat partitioning among stream-dwelling juvenile coho salmon, *Oncorhynchus kisutch*, and Dolly Varden, *Salvelinus malma*. Canadian Journal of Fisheries and Aquatic Sciences 47:2297-2306.

Sedell, J. R., G. H. Reeves, F. R. Hauer, J. A. Stanford, and C. P. Hawkins. 1990. Role of refugia in recovery from disturbances: modern fragmented and disconnected river systems. Environmental Management 14:711-724.

Reeves, G. H., J. D. Hall, T. D. Roelofs, C. O. Baker, and T. Hickman. 1991. Habitat enhancement and rehabilitation for anadromous salmonids. Pages 519-557. American Fisheries Society Publication No. 19.

Bisson, P. A., T. P.Quinn, G. H. Reeves, and S. V. Gregory. 1992. Best management practices, cumulative effects, and long-term trends in fish abundance in Pacific Northwest river systems. Pages 189-232. in R.J. Naiman, editor. Watershed management: balancing sustainability and environmental change. Springer-Verlag, New York.

Reeves, G. H. and J. R. Sedell. 1992. An ecosystem approach to the conservation and management of freshwater habitat for anadromous salmonids in the Pacific Northwest. Transactions of the

57th North American Wildlife and Natural Resources Conference 1992:408-415.
Thomas, J. W. , G. H. Reeves, and others. 1993. Viability assessments and management considerations for species associated with late-successional and old-growth forests of the Pacific Northwest: the report of the Scientific Analysis Team. USDA Forest Service, Portland, OR 530 p.
Reeves, G. H., F. H. Everest, and J. R. Sedell. 1993. Diversity of juvenile anadromous salmonid assemblages in basins in coastal Oregon with different levels of timber harvest activities. Transactions of the American Fisheries Society 122:309-317.
Thomas, J. W., G. H. Reeves, and others. 1993. Forest ecosystem management: an ecological, economic, and social assessment. Report of the Forest Ecosystem Management Assessment Team. USDA Forest Service, Portland, OR
Hicks, B. J. and G. H. Reeves. 1994. Restoration of stream habitat for fish using in-stream structures. Pages 67-92. in K. J. Collier, editor. Restoration of aquatic habitats. Selected papers from the second day of the New Zealand Limnological Society 1993 Annual Conference. New Zealand Department of Conservation, Wellington, New Zealand.
Reeves, G. H., L. E. Benda, P. A. Bisson, and J. R. Sedell. in press. A disturbance-based ecosystem approach to maintaining and restoring freshwater habitats of evolutionary significant units of anadromous salmonids in the Pacific Northwest. Special Publication of the American Fisheries Society.

KENNETH P. CURRENS
Department of Fisheries and Wildlife, Nash Hall 104, Oregon State University, Corvallis, Oregon 97331

Education
Ph.D. Oregon State University (Expected 1995). Conservation Genetics and Risk Assessment in Management of Hatchery and Wild Rainbow Trout Populations.
M.S. Fishery Science. Oregon State University (1987). Genetic Differentiation of Resident and Anadromous Rainbow Trout in the Deschutes River Basin, Oregon.
B.S. Fishery Science (with High Scholarship). Oregon State University (1983).
B.A. English. University of Oregon, Eugene, Oregon (1979).

Experience
Conservation Geneticist for U.S. Fish and Wildlife Service endangered salmon issues (present).
Genetics Program Leader, Oregon Cooperative Fishery Research Unit (1992-present). Analysis of allozyme, DNA, morphological, and genetic breeding studies of Pacific salmon Advising and coordination with state, federal, and Tribal fishery agencies, and private groups Genetic risk assessment.
Fishery Biologist. Represented Oregon State University in the Sea of Cortez, Mexico (1987).
Graduate Research Assistant (1983-1986). Genetic analysis of Columbia River chinook salmon and steelhead.
Teaching Assistant. Economic Ichthyology. Oregon State University (1983).
Technician. Oregon State University Fish Museum (1982-1983).
Chemist. Winter Products Company, Portland, Oregon (1979-1981).
Mathematics and Language Arts Tutor. Canby Union High School, Canby, Oregon (1978-1979).

Honorary Societies and awards
Walter Jones Certificate of Excellence in Fisheries Development (1987).
SOLMAREX Graduate Research Opportunity Award (1987).
Masters Student of Excellence in Fisheries and Wildlife (1985).
Phi Kappa Phi (1984).

Professional Organizations
American Association for the Advancement of Science
The American Fisheries Society
The American Society of Ichthyologists and Herpetologists
The Gilbert Ichthyological Society
Society for Conservation Biology
Society for the Study of Evolution

Professional and University Service
Scientific Reviewer for the *Transactions of the American Fisheries Society*, *Journal of Great Lakes Research*, *Conservation Biology*, *Aquaculture*, National Geographic Society, Research and Exploration, National Marine Fishery Service Saltonstall-Kennedy Grants (1992, 1993, 1995), NMFS Endangered Species Act Status Reviews (1995), Washington Sea Grant Program (1994), Washington Department of Fish and Wildlife, OS Extension Service (1991).

Genetic Consulting, Education and Policy Reviews:
Northwest Power Planning Council - chaired geneticist committee at two symposia.
Oregon Department of Fisheries and Wildlife
Oregon State University, Department of Fisheries and Wildlife - Guest lecturer: Genetics in Fisheries and Aquaculture Short Course (1988, 1990), Fishery Management (1992), Ecological Aspects of Park Management (1993), Wildlife Techniques (1994) - Conservation Biology Committee (1991), Promotion and Tenure Committee (1989-1990), Graduate Committee (1988-1989).
Oregon Trout
Oregon Aqua-Foods, Inc.
Pacific Rivers Council

Selected Publications
Currens, K.P., C.B. Schreck and H.W. Li. 1988. Reexamination of the use of otolith nuclear dimensions to identify juvenile anadromous and nonanadromous rainbow trout, Salmo gairdneri. Fish. Bull., U.S. 86:160-163.

Currens, K.P., C.S. Sharpe, R. Hjort, C.B. Schreck and H.W. Li. 1989. Effects of different feeding regimes on the morphometrics of chinook salmon (Oncorhynchus tshawytscha) and rainbow trout (O. mykiss). Copeia 1989(3):689-695.

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Currens, K.P. 1991. Rangeland redbands – trout of the desert. Oregon's Wildlife Resources 1(4):1-2

Schreck, C.B., M.S. Fitzpatrick and K.P. Currens. 1995. Pacific salmon (Oncorhynchus sp.). Pages 197-219 in N.R. Bromage and R.J. Roberts (eds.). Broodstock Management and Egg and Larval Quality, Blackwell Science Ltd., University Press, Cambridge.

Busack, C.A., and K.P. Currens. In Press. Genetic risks and hazards in hatchery operations: fundamental concepts and issues. Uses and Effects of Cultured Fishes in Aquatic Ecosystems. American Fisheries Society Special Publication XX.

Currens, K.P. In Press. What is a wild trout? A Population Geneticist's Perspective. Wild Trout V. Trout Unlimited, Inc. and the United States Fish and Wildlife Service, Denver, Colorado.

Adams, N.S., W.J. Spearman, C.V. Burger, K.P. Currens, C.B. Schreck, and H.W. Li. In Press. Variation in mitochondrial DNA and allozymes discriminates early and late forms of chinook salmon (Oncorhynchus tshawytscha) in the Kenai and Kasilof rivers, Alaska. Can. J. Fish. Aquat. Sci.

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Currens, K.P., C.B. Schreck, and H.W. Li. Genetic variation of rainbow trout in the Columbia River and northern Great Basin. Copiea.

Currens, K.P., C.B. Schreck, and H.W. Li. Meristic variation in rainbow trout of the Columbia River. Fishery Bulletin.

Currens, K.P., A.R. Hemmingsen, D.V. Buchanan, C.B. Schreck and H.W. Li. Genetic and zoogeographical implications of allozyme divergence and resistance to a microparasite in rainbow trout (Oncorhynchus mykiss). Evolution.

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KITTY GRISWOLD
Department of Fisheries, Oregon State University, Corvallis, Oregon, 97331

Education

B.A. English Literature, Reed College, Portland, Oregon, January, 1988.

M.S. Fisheries, Oregon State University, expected completion June, 1995.

Professional Experience

Graduate Research Assistant, Department of Fisheries and Wildlife, Oregon State University. March 1995 to present.

Teaching Assistant, Department of Fisheries and Wildlife, Oregon State University. January,

1995-March 1995. "Multicultural Perspectives of Natural Resources" FW 240.
Graduate Research Assistant, Department of Fisheries and Wildlife, Oregon State University. Conducted research on the genetic relationships and life histories of coastal cutthroat trout in two basins.
Biological Technician, U.S.F.S., PNW Research Station. June 1991-February 1992.
Data Entry, U.S.F.S., PNW Research Station, Corvallis, OR. March, 1991-June, 1991.
Biological Aid, U.S.F.S., Waldport District, Waldport, OR. June, 1990-September, 1990.

Presentations
Stream Team, Oregon State University. October, 1992. Presented conceptual framework and methods for M.S. research.
Fishery Biology, Department of Fisheries and Wildlife, Oregon State University. November, 1993 and 1994. Guest lecturer "Genetics and Stock Identification".
Stream Team, Oregon State University. December, 1994. Genetic variation of cutthroat trout within two coastal basins.
American Fisheries Society, Ashland, Oregon. February, 1995. Genetic relationships of resident and anadromous coastal cutthroat trout.

Awards
Oregon Federation of Fly fishers Scholarship 1992.
Oregon State University College of Agricultural Sciences Registry of Distinguished Graduate Students 1995.

Professional Societies
American Fisheries Society, Gilbert Ichthyological Society

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28 April 1995
Date Prepared

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1996 EXXON VALDEZ TRUS . . . COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996						
Personnel		$80.1						
Travel		$32.1						
Contractual		$196.1						
Commodities		$1.2						
Equipment		$1.5	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$0.0	$311.0	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration		$25.7						
Project Total	$0.0	$336.7	$250.0	$120.0				
Full-time Equivalents (FTE)		2.6						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:
Travel costs for K. Currens, Oregon State University, to Anchorage and Cordova are shown under the USFS travel costs because government fares are cheaper than commercial rates.

1996

Pre pared by: G. H. Reeves

Project Number:
Project Title: Cutthroat trout and Dolly Varden in Prince William Sound, Alaska: the relation among and within populations of anadromous and resident forms
Agency: USFS

FORM 3A
AGENCY
PROJECT
DETAIL

4/29/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
	G. H. Reeves	Principal Investigator	14-5	3.5	5,300	0	18.6
		Research Fish Biologist					0.0
*				0.5	5,300	0	2.7
							0.0
	K. Griswold	Research Assistant	9	12.0	2,900	0	34.8
		Research Fish Biologist					0.0
							0.0
		Fish Technici ns (2)	5	15.0	1,600	0	24.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		31.0	15,100	0	
Those costs associated with program management should be indicated by placement of an *.						Personnel Total	$80.1

Travel Costs:		Ticket	Round	Total	Daily	Proposed
PM	Description	Price	Trips	Days	Per Diem	FFY 1996
*	Corvallis, OR to Anchorage, AK to attend workshops	$650	5	18	136	5.7
	(G. Reeves 2, K . Currens 2, and K. Griswold 1)					0.0
						0.0
	Corvallis, OR to Cordova, AK for field collections	$750	12	112	155	26.4
	(G. Reeves 3, K. Currens 3, K. Griswold 4, Technician 2)					0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
Those costs associated with program management should be indicated by placement of an *.					Travel Total	$32.1

1996

Project Number:
Project Title: Cutthroat trout and Dolly Varden in Prince William Sound, Alaska: the relation among and within populations of anadromous and resident forms
Agency: USFS

FORM 3B
Personnel
& Travel
DETAIL

1996 EXXON VALDEZ TRUS' :OUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:		Proposed
Description		FFY 1996
Air Charter - Cordova to field sites	20 hours @ $350/hour	7.0
Boat Charter - Cordova to field sites	20 days @ $1200/day	24.0
Coop Agreement with Dept. of Fisheries and Wildlife, Oregon State University, to do genetic, meristic, and otolith microchemistry ana ysis. See Form 4 for details.		165.1
When a non-trustee organization is used, the form 4A is required.	Contractual Total	$196.1

Commodities Costs:		Proposed
Description		FFY 1996
Dry Ice (including shipment from Seattle to Cordova)	600 lbs @ $2.00/lb	1.2
	Commodities Total	$1.2

1996

Project Number:
Project Title: Cutthroat trout and Dolly Varden in Prince William Sound, Alaska: the relation among and within populations of anadromous and resident forms
Agency: USFS

FORM 3B
Contractual & Commodities DETAIL

4/29/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FFY 1996
Waders	5	100	0.5
Foul Weather Gear	5	200	1.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		New Equipment Total	$1.5

Existing Equipment Usage: Description	Number of Units	Inventory Agency

1996

Project Number:
Project Title: Cutthroat trout and Dolly Varden in Prince William Sound, Alaska: the relation among and within populations of anadromous and resident forms
Agency: USFS

FORM 3B
Equipment
DETAIL

4/29/95

1996 EXXON VALDEZ TRUS[illegible] COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS					
			Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
Personnel		$66.0						
Travel		$0.0						
Contractual		$99.1						
Commodities		$0.0						
Equipment		$0.0						
Subtotal	$0.0	$165.1						
Indirect								
Project Total	$0.0	$165.1		$40.0				
Full-time Equivalents (FTE)		18.0						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:
Funds will be transferred to Oregon State University in Cooperative Agreement between USFS and Dept. of Fisheries and Wildlife, Oregon State University. This will reduce overhead costs from 0.40 to 0.07.

1996

Prepared:

Project Number:
Project Title: Cutthroat trout and Dolly Varden in Prince Williams Sound, Alaska: the relation among and within populations of anadromous and resident forms
Name: USFS

FORM 4A
Non-Trustee
DETAIL

4/29/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:			Months	Monthly		Proposed
Name	Position Description		Budgeted	Costs	Overtime	FFY 1996
Ken Currens	Research Genetisist		6.0	5	0	30.0
						0.0
	Laborotory Technician		12.0	3		36.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		18.0	8	0	
					Personnel Total	$66.0

Travel Costs:		Ticket	Round	Total	Daily	Proposed
Description		Price	Trips	Days	Per Diem	FFY 1996
See Form 3 B - travel costs for K. Currens included there because of availability of cheaper rates						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$0.0

1996

Project Number:
Project Title: Cutthroat trout and Dolly Varden in Prince Williams Sound, Alaska: the relation among and within populations of anadromous and resident forms
Name: USFS

FORM 4B
Personnel
& Travel
DETAIL

4/29/95

1996 EXXON VALDEZ TRUS. __ COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:	Proposed
Description	FFY 1996
Genetic and meri ic analysis (estimated for 1600 fish)	84.0
Otolith microchemistry analysis estimated 400 fish)	15.1
Contractual Total	$99.1

Commodities Costs:	Proposed
Description	FFY 1996
Commodities Total	$0.0

1996

Project Number:
Project Title: Cutthroat trout and Dolly Varden in Prince Williams Sound, Alaska: the relation among and within populations of anadromous and resident forms
Name: USFS

FORM 4B
Contractual & Commodities
DETAIL

4/29/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units

1996

Project Number:
Project Title: Cutthroat trout and Dolly Varden in Prince Williams Sound, Alaska: the relation among and within populations of anadromous and resident forms
Name: USFS

FORM 4B
Equipment
DETAIL

4/29/95

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United States Department of Agriculture | Forest Service | Pacific Northwest Research Station | Forestry Sciences Laboratory
3200 S.W. Jefferson Way
Corvallis, Oregon 97331
FAX (503) 750-7329

Date: 17 July 1995

Subject: Response to Peer Review Comments of EVOS Trustee Council Proposal

To: Dr. R. Spies

From: Gordon Reeves

The following addresses the concerns developed in the peer and budget review process of Project 96145/Cutthroat Trout and Dolly Varden: the Relation Among and Within Populations of Anadromous and Resident Forms. I have been in the field since the beginning of July and only returned to my office today. I hope this memo is not too late.

Peer Review

1) Concern about sample sizes.

We have proposed to collect 40-50 individuals of the resident and anadromous forms at each site. This is a generally accepted sampling size for relatively small fish populations. The sampling will be replicated (where possible) and this will partially compensate for problems associated with small sample sizes.

2) Concern about risk of expiration for small cutthroat trout populations.

We will minimize this by: (1) identifying vulnerable populations prior to finalizing the populations to be sampled in the study and avoid sampling such populations; and (2) selecting individuals representing all size and age classes in the population; we will not just focus on adults.

Budget

Please see the revised budget that I have prepared.

1) Personnel Costs

We have reduced the costs for the technicians by 1/3 since each will be employed for 6 months of the FY.

2) Travel Costs

Appropriate changes have been made.

3) Contractual Costs

We will sample 2 populations (40 fish of the resident and 40 of the anadromous form) for 2 species (cutthroat trout and Dolly Varden) at 8-10 sites. This results in approximately 1600 fish. You will notice that the contractual costs on

the revised budget are decreased nonetheless ($165.K in DPD and $87.K in the revision). This is because of reduced personnel costs and that some of the equipment we thought would be needed in already available and that that we need to buy is less expensive than originally thought.

cc: S. Schubert
D. Gibbons

United States Department of Agriculture | Forest Service | Pacific Northwest Research Station | Forestry Sciences Laboratory
3200 S.W. Jefferson Way
Corvallis, Oregon 97331
FAX (503) 750-7329

Date: 17 July 1995

Subject: Revision of EVOS proposal budget

To: Dr. R. Spies

From: Gordon Reeves

Here is the revised budget for the EVOS proposal. The major changes are: (1)elimination of salary for myself - This will be covered by the FS; (2) elimination of salary for Ken Currens - He will still be associated with the project but because of a new position will not require funding; (3) reduction of travel costs by reducing number of people travelling to and staying in Cordova; and (4) reduction of sampling sites from 10 to 8 (4 in oiled areas and 4 in unoiled areas). With this revised budget we will meet the original objectives of the proposal.

Here is a comparison of proposed and revised budget:

	Original Proposal	Revised
USFS		
Personnel		
Principal Investigator	$21.3	0
Research Assistant	34.8	34.8
Technicians (1.5 FTE)	24.0	16.0
Travel		
To Cordova and per diem	32.1	24.0
Transport to field sites	31.0	24.0
Misc.	3.7	1.5
Subtotal	146.9	100.3
Contractual (Oregon State University)		
Personnel		
Principal Investigator	30.0	0
Technician	36.0	36.0
Genetic Analysis	84.0	44.0
Otolith Microchemistry	15.1	7.5
Subtotal	165.1	87.5
General Administration	25.7	12.2
Total	$336.7	200.0

Kittlitz's Murrelet: Biology, Abundance, and Population Genetics

Project Number:	96148
Restoration Category:	Research (New)
Proposed By:	NBS
Cooperating Agencies:	NPS, USFS, USFWS
Cost FY 96:	$99,800
Total Cost:	$400,000
Duration:	4 years
Geographic Area:	Gulf of Alaska
Injured Resource:	Kittlitz's Murrelet, Seabirds

INTRODUCTION

The Kittlitz's Murrelet (Brachyramphus brevirostris) is one of the rarest seabirds in North America, and listed as a Category II species in Alaska by the U.S. Fish and Wildlife Service. Limited data suggest a total world population of about 20,000 birds (van Vliet 1993). Except for small populations in the Russian far east, most Kittlitz's Murrelets breed in Alaska. Genetic studies indicate that the Kittlitz's Murrelet diverged from the closely related Marbled Murrelet (B. marmoratus) about 2.2 million years ago at the onset of the Pleistocene ice age (Pitocchelli et al. 1995; Moum et al. 1994; Piatt et al. 1994). There may be considerable genetic variability among extant populations of Kittlitz's Murrelets, especially between Gulf of Alaska and western Aleutian forms (Friesen et al. 1995, in prep.). Unlike Marbled Murrelets in Alaska-- most of which nest in trees (Naslund et al. 1995)-- Kittlitz's Murrelets nest exclusively on the ground in alpine habitats (Day et al. 1983; Day 1995; Piatt et al. 1994).

The geographic distribution of Kittlitz's Murrelet in Alaska reflects its ancient association with glacial ice. Disjunct breeding populations are concentrated within mountainous regions containing large glacier fields (e.g., Prince William Sound), remnant high-elevation glaciers (Alaska Peninsula) and recently deglaciated coastal mountains (Seward Peninsula). The nesting biology of the Kittlitz's Murrelet is poorly known. To date, only 13 confirmed nests have been been described (Day et al. 1983; Day 1995; Piatt et al. 1994) and all but one were located in Alaska. Nest-sites are typically at high elevation (230-1070 m), above the treeline in forested regions, usually on a south-facing slope (20-40° angle), and within a few hundred meters of a mountain top. Nest-sites are usually 5-15 km from the nearest coastline, and in relatively inaccessible mountain regions. Birds lay their single egg on bare rock-- usually on a scree or talus slope devoid of vegetation.

Very little is known of Kittlitz's Murrelet breeding biology or feeding ecology (Piatt 1994). In 1993, Naslund et al. (1994) monitored a nest-site by using a remote camera. They recorded 53 feeding visits encompassing the early and late nestling period. All food loads consisted of single fish. Chicks were fed throughout the day (4-6 feeds/day), although most (67%) feedings occurred between dusk and dawn. Of 33 prey items recorded up close, 67% were sandlance, 18% capelin, and 15% unidentified. Both adults provisioned chicks about equally. These results are consistent with other studies of diet, which show that Kittlitz's Murrelets forage mostly on small schooling fishes (Hobson et al. 1995). The growth rate of the Kittlitz's Murrelet chick was similar to that of Marbled Murrelets, but the chick-rearing period appeared to be substantially shorter (ca. 23 vs. 28+ days).

NEED FOR THE PROJECT

Following the Exxon Valdez oil spill (EVOS), over 30,000 dead, oiled seabirds were recovered from beaches. An estimated total of 250,000 seabirds were killed by oil (Piatt and Ford 1995). Perhaps 1000-2000 of these birds were Kittlitz's Murrelet (Brachyramphus brevirostris), which could represent 5% or more of this species world population (van Vliet 1993, 1994). If so, this suggests that Kittlitz's Murrelet was the species most impacted by the spill.

Little research has been conducted on Kittlitz's Murrelet-- either before or after the spill. There is a basic lack of quantitative information on its population status and breeding ecology (Piatt 1994)-- one of the reasons it was not a good candidate for damage assessment studies conducted immediately after the spill. This project will i) compile and analyze available unpublished and published data to assess the abundance and distribution of Kittlitz's Murrelet in Alaska, and, ii) conduct original research on the breeding biology, pelagic distribution and population genetics of Kittlitz's Murrelet in Alaska.

PROJECT DESIGN

A. Objectives

1. Compile existing data on the distribution and abundance of Kittliz's Murrelet from unpublished and published sources.

2. Conduct censuses at sea of Kittlitz's Murrelet in core areas of abundance within the EVOS zone (Prince William Sound, Kenai Peninsula, Alaska Peninsula). (Start in FY 1997).

3. Attempt to locate more nest-sites in the Kenai Peninsula and study aspects of breeding biology and diets using remote cameras.

4. Study the fine-scale distribution of Kittliz's Murrelet in Kachemak Bay to assess pelagic habitat requirements and relationships with prey at sea.

5. Support ongoing genetic studies of Brachyramphus murrelets to asssess the population genetics of these species throughout their range, and identify potential subspecies characteristics.

B. Methods

1) Several historical databases on Kittlitz's Murrelets will be compiled to examine population distribution and abundance. These may include OCSEAP cruise data from the 1970's and 1980's, U.S. Fish and Wildlife Surveys of Prince William Sound and lower Cook Inlet, NBS pelagic survey data (J. Piatt, unpubl. data), and extensive Brachyramphus surveys conducted by M. McAlister in the 1980's (data residing with USFS in Arcata, CA). All these data sets are now on computer, and require varying degrees of error-checking and manipulation before combining them to examine Kittlitz's Murrelet distribution.

2) Because Kittlitz's Murrelets are highly localized during the breeding season, and major population centers have been identified, it is possible to carefully census their populations using standard boat survey techniques. This would entail systematic surveys of core areas in Prince William Sound, and along the Kenai and Alaska Peninsulas. The goal will be to obtain precise population estimates in core areas, provide a baseline to assess future population changes, and possibly compare with historical data to see if major changes have already occurred. Pelagic surveys in areas outside of Kachemak Bay will not be started until FY 1997, pending analysis of historical databases.

3) There are no established methods for locating nest-sites. All nests that have been previously described have been found accidentally. However, in 1994 we began systematic ground searches of potential nesting habitat in the Kenai mountains near Kachemak Bay, where two nests have been previously located within a single valley (Piatt et al. 1994). In 1995, we will initiate a pilot project to use trained dogs to search potential nesting areas surrounding this valley. Owing to the vast areas and inaccessible habitat used for nesting by Kittlitz's Murrelet, this may be the only practical way to search large areas efficiently. If this technique is successful in 1995, it could be expanded in 1996 to include a dedicated search effort over a larger range of mountains along the southwestern Kenai Peninsula which is accessible by roads and trails from Seldovia. If a nest or nests are located, we will study them by use of remote cameras. A successful pilot project in

1993 (Naslund et al. 1994) showed that use of remote cameras is an efficient and cost-effective way to study murrelet breeding biology in inaccessible breeding locations.

4) The pelagic distribution and feeding ecology of Kittlitz's Murrelet will be studied in Kachemak Bay. Previous studies (Kuletz 1989) showed that inner Kachemak Bay is an area of great importance to Kittlitz's Murrelet, and the population is highly concentrated at the outflow of the Grewingk Glacier. Detailed surveys of this area will be conducted to assess habitat characteristics of this important foraging area. The distribution and composition of forage fish schools will be measured from hydroacoustic surveys and net-trawls, and CTD casts will be used to characterize water masses.

5) Genetic studies of Brachyramphus murrelets are ongoing (Moum et al. 1994; Friesen et al. 1994; Piatt et al. 1994; Pitocchelli et al. 1995; Friesen et al. in prep.). Samples for genetic analysis of murrelets have been obtained by collection at sea, collecting blood from captured animals, and from museum specimens. We already have samples from the EVOS area (Prince William Sound, Kachemak Bay) but lack data from specimens in other important population centers (Glacier Bay, Alaska Peninsula, Aleutian Islands). We propose to obtain DNA specimens from all these areas, using blood and/or museum specimens where possible, to complete our survey of population genetics for Kittlitz's Murrelet.

Previous DNA analyses have relied on PCR amplification of mitochondrial genes such as Cytochrome b (Friesen et al. 1994). However, this gene may not evolve fast enough to provide markers for populations that were established since recession of the Pleistocene glaciers. We propose to use a new technique involving the analysis of single-stranded conformational polymorphisms (SSCP's). This is a relatively rapid and inexpensive method of detecting even a single mutation in small fragments (~350 base pairs) of amplified DNA. This technique may prove extremely useful for measuring genetic variability in northern seabird populations in general, and among Kittlitz's Murrelet populations in particular.

C. Schedule

November 1995 - Initiate historical data analysis

April-June, 1996 - Nest searches in Kenai Mountains

June-August, 1996 - Pelagic studies in Kachemak Bay
- DNA sample collection outside EVOS area

January-September 1996 - Laboratory genetic analyses

November 1996 - Preliminary report of activities and results

D. Technical Support

No technical support is required for this project. All technical support is available in-house to the primary investigators.

E. Location

Data will be analyzed at research instituions in Anchorage (Alaska Science Center, NBS). Primary field work will be conducted in Kachemak Bay and adjacent mountains of the Kenai Peninsula. Additionally, surveys will be conducted in selected areas of Prince William Sound and the Alaska Peninsula.

PROJECT IMPLEMENTATION

This project will be implemented by the National Biological Survey, Alaska Science Center.

COORDINATION OF INTEGRATED RESEARCH EFFORT

This project is a collaborative effort between NBS (John Piatt, Anchorage), USFWS (Migratory Bird Management, Anchorage), USFS (Redwood Research Lab, Arcata CA), and Queen's University in Ontario, Canada (Vicki Friesen). Pelagic studies of murrelets in Kachemak Bay will be coordinated with MMS and EVOS forage fish studies being conducted there.

PERSONNEL QUALIFICATIONS

Dr. John F. Piatt, Principal Investigator, is employed as a Research Biologist in the Alaska Science Center. Dr. Piatt has conducted research on seabirds and marine ecosystems since 1977 in both the North Atlantic and Pacific oceans. He has published more than 35 peer-reviewed papers on capelin, cod, whales, murrelets and other seabirds, trophic relationships, genetics, energetics, and oil pollution, and on related subjects. A curriculum vitae is available on request.

FY 96 BUDGET ($K)

Personnel	
GS-7/9 Biotech	32.0
Summer Seasonals (2)	16.0
Travel	
Public Transportation	3.0
Helicoptor	5.0
Per Diem	2.0
Boat Operations	
Charter	10.0
Whaler support	5.0
Fuel	2.0
Contracts	
Dogs/Trainer	10.0
Genetic studies	10.0
Subtotal	95.0
Gen. Admin.	4.8
Total	99.8

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Hobsen, K.A., and J.F. Piatt. 1994. Using stable isotopes to determine seabird trophic relationships. Journal of Animal Ecology

Kuletz, K. 1989. Murrelet studies of Kachemak Bay, Summer, 1988. U.S. Fish and Wildl. Serv., Unpubl. Report. 32 p.

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Pitocchelli, J., J.F. Piatt, and M. Cronin. Morphological and genetic divergence among populations of Brachyramphus murrelets. Wilson Bulletin, in press.

van Vliet, G.V. 1993. Status concerns for the "global" population of Kittlitz's Murrelet: Is the "Glacier Murrelet" receding? Pacific Seabird Group Bulletin 20: 15-16.

van Vliet, G.V. 1994. Kittlitz's Murrelet: The species most impacted by direct mortality from the Exxon Valdez oil spill? Pacific Seabirds 21(2): 5-6.

Archaeological Site Stewardship,
Kachemak Bay, Shelikof Strait, and Chignik

Project Number:	96149
Restoration Category:	Monitoring
Proposer:	Alaska Office of History and Archaeology, ADNR
Lead Trustee Agency:	ADNR
Cooperating Agencies:	U.S. Fish and Wildlife Service, DOI
Duration:	Five years, FY 96 - FY 2000
Cost FY 96:	$70,300
Cost FY 97:	$60,000 (estimated)
Cost FY 98:	$50,000 (estimated)
Cost FY 99:	$50,000 (estimated)
Cost FY 00:	$50,000 (estimated)
Geographic Area:	Kenai Peninsula, Kodiak, Alaska Peninsula
Injured Resource/Service:	Archaeological Resources

ABSTRACT

The archaeological site stewardship program will provide training and coordination for a cadre of volunteers to monitor vandalized archaeological sites in the oil spill area beyond the ability of agency monitoring. Volunteer site stewards will protect damaged sites in Kachemak Bay, Uganik Bay, Uyak Bay and the Chignik area of the Alaska Peninsula. Further protection will come from increased local awareness of harm from site vandalism.

INTRODUCTION

An important key to saving Alaska's cultural heritage sites from continuing loss is promotion of local stewardship of historic and prehistoric sites. The idea of site stewardship is to get the local people to take an interest in sites and the information they contain and to convince people to report site destruction or damage to sites. Other states, notably Arizona and Texas, have created organizations in which people with interest in archaeology but with very little training can cooperate with professional archaeologists in monitoring sites. The Arizona program links a system of volunteer site stewards with governmental archaeologists. The system involves stewards in monitoring selected sites in danger of looting. In return, the stewards receive schooling in the history and prehistory of the state and training in data collection. A successful site stewardship program must depend very heavily on interest, education and active involvement of the public.

An attempt was made to start a stewardship program in Southcentral Alaska during 1992, when the Exxon Oil Spill Trustees funded development of a manual and fieldbook suitable for beginning a program in the spill area. A first draft of the manual and fieldbook were written with the intent of revising them to fit specific situations in different areas. Funding of the effort was not continued after the first year and the program never implemented.

The U.S. Fish and Wildlife Service and the Alaska Office of History and Archaeology, developers of the documentation for the program, have each attempted to form unfunded volunteer programs as opportunities arose. Archaeologists from the federal agency have been active in the Chignik area, working with interested residents to document and monitor sites which are being looted. Local people requested USFWS archaeologists return to Chignik during 1995 and help educate local students about the value of protecting archaeological sites. Chignik residents report vandalism to a number of nearby sites along the coast.

Resident fishermen in the areas of Uganik Bay and Uyak Bay on Kodiak Island have expressed to U.S. Fish and Wildlife Service archaeologists interest in monitoring sites near their setnet locations. Those sites have suffered depredations from vandals and one, KOD-171, is one monitored in the past by the USFWS. The interest shown demonstrates that education and encouragement of the local residents will aid site protection.

The Office of History and Archaeology met with archaeologists in Homer and the Kenai-Soldotna area during 1994 to develop a site monitoring program. Sites selected in the central part of the Kenai Peninsula include prehistoric sites eroding from natural and human causes and a historic cabin which has frequently been used for shelter by transient visitors. The latter attempts were developed with University of Alaska, Anchorage, Kenai campus staff and interested student volunteers.

The Kachemak Bay area which contains many sites rich in valuable artifacts also has many people interested in seeing the sites protected from vandals and erosion. Two residents of

Homer trained as archaeologists and having intense interest in preventing site loss have compiled a list of people interested in monitoring nearby sites. Lack of funding crippled the program and it is moving forward slowly but with good potential for success sometime in the future. Initial discussions with local residents revealed individuals in Peterson Bay, China Poot Bay, Tutka Bay, Mallard Bay, Halibut Cove, and Seldovia Bay all interested in monitoring exposed sites which are suffering vandalism. They have requested some training and direction in accomplishing effective monitoring.

Several Native organizations have voiced interest in stewardship programs, particularly in the Prince William Sound and Kodiak areas. Those groups are expected to submit steward proposals involving members of their individual organizations. This proposal aims at involvement of other interested individuals but will include cooperation with the Native projects. The expected Native organization proposals are likely to emphasize damaged sites on private lands while this project will continue to deal with sites on public lands. Training material developed in a prior stewardship project and time requested in this project will aid training in other stewardship proposals.

The basis of a site stewardship program is effective creation of a partnership between interested individuals of the general public, professional archaeologists and historians, and government responsible for protecting those resources. Successful stewardship depends on close cooperation and identifiable benefit to all participants. Because of the remote location of many Alaskan sites and lack of funding to protect them, education of the public and recruitment of their help may be the best chance to protect Alaska's heritage in the future.

NEED FOR THE PROJECT

A. Statement of Problem

Vandalism of archaeological sites during the cleanup phase of the Exxon Valdez Oil Spill was well documented in the Oil Spill area, particularly in Prince William Sound and in the Kodiak Island area. Vandalism during cleanup appears to have been associated with people placed near sites while living on chartered boats. Many of the boats working on the cleanup effort were from local coastal communities and crews were local residents. Circumstantial evidence indicates that some crew members were involved in the looting of sites. The fear among cultural resource managers is that knowledge about site locations and the practice of site looting accelerated during oil spill cleanup, continued and spread outside the oil spill area. Recent events of site looting by crew members from Gulf of Alaska herring fishing boats at the Old Togiak Site indicate the pattern has continued, very probably at a more intensive rate. The Alaska Office of History and Archaeology and the National Park Service recently sent a joint letter to fishermen active in the Bristol Bay herring fishery which states the case against and legal penalties for looting sites.

B. Rationale

Continuing loss of sites and data to vandals reduces the finite number of sites which exist in the spill area. Unless a means to stop the destruction is found, the ability of the archaeological resources to address questions important to the cultural heritage of Alaskans will be diminished beyond the ability to achieve answers. Agencies concerned with archaeological sites have attempted to monitor damaged sites but with little success due to lack of sufficient personnel for the work load. Other duties of the agency employees do not allow adequate time to be spent monitoring and protecting damaged sites.

C. Summary of Major Hypotheses and Objectives

The major objective of the proposed stewardship project is to protect damaged and endangered archaeological sites of the Kachemak Bay, Shelikof Straits and Chignik areas from further destruction from vandals. The basic thesis is that local residents who have intimate knowledge of the local sites will, with minimal training be able to monitor the status of sites and notify agency officials immediately when damage occurs. Local people will be able to monitor the sites much more efficiently that non-resident agency archaeologists who are available at uncertain and infrequent times. In other state programs, those who damage sites, unknowing about the seriousness of damage they cause, have become site stewards and among the strongest defenders of local sites after minimal public education and steward training.

D. Completion Date

From inception of the project on October 1, 1995 the first goal will be gathering of training materials, supplies for stewards, and review of local stewards. Stewards will be trained and operative by May 1, 1996, and monitoring will be continuing throughout the remainder to the fiscal year. A report on steward accomplishments and status of sites will be completed by September 30, 1996. The project is planned to continue with support for a period of three years after which expenses will be assumed either by volunteer stewards or agency budgets. The need for labor intensive training and coordinator salary will reduce to zero in 1999.

COMMUNITY INVOLVEMENT

This archaeological site stewardship project will be based on community involvement in the Homer and Chignik areas and among remote residents in Uyak Bay and Uganik Bay on Kodiak Island. Site stewards will be recruited in and around those communities and they will be provided some material and logistic support. The project will depend on the interest and cooperation of the local stewards in providing time and information. The agency archaeologists will meet either singly or with groups of local stewards and provide them with training and materials needed for site monitoring.

FY 96 BUDGET

The FY 96 budget will include travel and time to provide initial training to local stewards including visits to sites with the stewards.

Personnel	$50.8
Travel	8.0
Contractual	4.7
Commodities	3.0
Equipment	0.0
Subtotal	66.5
Gen. Admin.	7.9
Total	74.4

PROJECT DESIGN

A. Objectives

The basic aim of this stewardship project is protection of sites being destroyed by vandals. The immediate objectives are:

1. Identify sites needing monitoring and stewards willing to track status of the sites, and train the stewards in the procedures of effective monitoring.
2. Implement the field and reporting procedures which will allow land owner\managers to know what impacts are occurring on the sites and devise a response to damaging activities.

B. Methods

The site stewardship program is an extension of agency monitoring efforts aimed at tracking vandalized sites in locations easily accessible to vandals but where agency personnel are not able to visit. Effectiveness of the program will be judged in the lack of continuing damage and in the natural stabilization of the exposed site deposits. A second gauge of positive program results will be increased local recognition of the harm from site looting as a result of local public advocacy by the stewards Another, although secondary, gauge for the efficiency of the effort will be identification and investigation by agency investigators of site looters.

Site stewards will be identified from past expressions of interest and trained in proper note recording, use of cameras to record site status, and procedures for reporting to the area coordinator. Specific training will be provided to make initial site maps and detailed descriptions. Permanent reference points for observation over several seasons will be established to insure comparable information over time. Visits to target sites by stewards and program supervisors several times in the first year will help encourage and train the stewards for working by themselves. No collecting of surface artifacts or testing, except as specifically

authorized by site owners, will be a part of the program.

Information provided by the stewards to program supervisors and the overall coordinator will then be forwarded to the appropriate land manager/owner for action as necessary. Coordination of findings over the entire area of the stewardship program will allow increases or declines in site vandalism to be identified. Hotspots of looter activity will be documented thereby allowing agency defense against the looters to begin in an effective manner.

C. Contracts and Other Agency Assistance

No major contracts are anticipated in this project. The only contractual activity will be aircraft or boat charters on a per hour basis. Other agency assistance will be in coordination of transportation and field housing by agency training personnel. Such coordination will be developed as necessary as specific activities allow.

D. Location

The sites to be monitored by stewards will be along the south shore of Kachemak Bay, along the shores of Uganik Bay and Uyak Bay, and in the Chignik area.

SCHEDULE

A. The steps to be accomplished during the first year of this proposed three year project will commence with the approval of the Trustees and beginning of the federal fiscal year, October 1, 1995.

Startup (October 1, 1995) - February 1, 1996:	Complete procedural requirements for final approval of project including any additional peer review, coordination with other projects, and NEPA compliance (FONSI anticipated). Preliminary site and steward selection concluded.
February 1 - May 1, 1996	Training documentation provided to stewards, site selection finalized, sites visited and site documentation finalized.
May 1 - September 1, 1996	Monitoring reports from stewards to coordinators due for compilation.
October 1, 1996	Annual report to Trustees on FY 96 field work.

B. Project Milestones and Endpoints

The first milestone to be achieved during the first year of the project will be establishment of a roster of site stewards and the mechanism for reporting their observations to a central coordinator. Second, sites selected for attention will be documented and monitored. The

final accomplishment during year 1 of the project will be submittal of the annual report of activities and findings. The second year milestones will be updating training of volunteer stewards as needed, continued monitoring and report of activities and findings. The milestone to be accomplished during the third year of the project will again be training as necessary, monitoring and preparation of the annual report. During the third year, the annual report will include a summary of the entire program, review of findings, and identification of local trends in vandal activity. The third annual report will constitute the final report for the project to be completed by December 31, 1998.

C. Project Reports

Project reports will be submitted on an annual basis over the proposed life of this project, each year for three years. Each annual report will detail the status of sites monitored, identify site stewards assigned to specific sites, observations during the year, and cumulative findings to that date. The final report, third annual report, will compile findings from prior years and provide analysis of trends based on project observations. Recommendations to site owners will be provided for protection of sites. The in place structure of the project is anticipated to continue on an individual owner/land manager basis at no cost to the Trustees.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

The project leader and manager from the Alaska Department of Natural Resources also prepared for the Trustees, the study: ***1994 EVOS Report, Spill Area Site and Collection Restoration Plan***. During interviews for that study, representatives of the spill area communities were polled about their thoughts on site stewardship programs. A meeting of Prince William Sound community representatives was also attended where those representatives discussed a coordinated program proposal to be submitted for consideration beyond any agency effort. This proposal will allow support and coordination of volunteer interest and effort already in place in the three areas identified.

Coordination of the field visits of the agency training personnel will occur with normal agency field trips. In Kachemak Bay, Alaska Division of Parks and Outdoor Recreation rangers have agreed to help provide transportation when possible for site visits. In the Kodiak area, visits to sites will be supported on U.S. Fish and Wildlife Service aircraft flights as possible to schedule.

ENVIRONMENTAL COMPLIANCE

Certification of environmental impact by the project will be prepared by the U.S. Fish and Wildlife as it is the federal agency active in this project. A finding of no significant impact (FONSI) is anticipated. No other permitting or licensing is anticipated as all activities proposed are observational and non-destructive.

PERSONNEL

The project personnel in this proposal are Judith E. Bittner, Project Manager, and Douglas R. Reger, Project Leader. The agency representative for the U.S. Fish and Wildlife Service is Charles E. Diters, Regional Archaeologist. Resumes of professional qualifications for Bittner, Reger and Diters are attached.

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1981 PhD.- Anthropology, Washington State University

PROFESSIONAL EXPERIENCE:

1964-65	Field and museum assistant, Univ. of Alaska, Fairbanks
1966	Field assistant, Alaska Methodist Univ.
1966-67	Laboratory/research assistant, Alaska Methodist Univ.
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 Univ.
1972	Assistant Highways archaeologist, Washington State Univ.
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-	Archaeologist, Alaska Division of Parks and Outdoor Recreation

PUBLICATIONS/REPORTS:

1972 *An archaeological survey in the Utopia area, Alaska,* **Anthropological Papers of the University of Alaska**, 15(2), with R.D. Reger

1974 *Prehistory of the northern Kenai Peninsula,* In **Prehistory of the North American Subarctic: the Athapaskan Question**, edited by J.W. Helmer, S. VanDyke, and F.J. Kense, Univ. of Calgary, p. 16-21

1977 *An Eskimo Site near Kenai, Alaska,* **Anthropological Papers of the University of Alaska**, 18(2): 37-52

1983 *Norton: a changing southeastern boundary,* **Arctic Anthropology** 19(2): 93-99, with Joan B. Townsend

1987 *Archaeology 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, with J. David McMahan and C. E. Holmes

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1971	A.B. - Anthropology, Dartmouth College
1977	A.M. - Anthropology, Brown University

Field Experience

1970	Excavation, Healy Lake Village Site, University of Alaska
1970	Archaeological Survey, Alyeska Pipeline Project, University of Alaska
1971	Archaeological Survey, Aniginigurak and Mosquito Lake Sites, University of Alaska
1977	Archaeological Survey, National Petroleum Reserve, Alaska, National Park Service
1978	Archaeological Survey, National Petroleum Reserve, Alaska, National Park Service
1978	Excavation, Russian Bishop's House, Sitka National Historic Park, Alaska, National Park Service
1980-82	Archaeological survey and project clearances, Chugach National Forest, Alaska
1982-Present	Archaeological survey and project clearances, National Wildlife Refuges throughout Alaska

Other Appointments

1989	Alaska State Museum Collections Advisory Committee, Vice-Chair, 1989-91, Chair, 1991
1991-92	Board of Directors, Alaska Anthropological Association
1991	Iditarod National Historic Trail Advisory Committee

Professional Affiliations

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

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University of Wisconsin, Madison: M.S, Anthropology, ABD, 1973
University of Arizona, Tucson: B.A. Anthropology, with Honors, 1969
George Washington University, Washington, D.C.: 1965-1967
Several management and supervisory training courses

WORK EXPERIENCE

1984 to present:	State Historic Preservation Officer and Section Chief of the Office of History and Archaeology, Division of Parks and Outdoor Recreation, Alaska Department of Natural Resources
1983 to 1984:	Historian, Division of Geological and Geophysical Surveys, Department of Natural Resources
1982 to 1983:	Director, Division of Parks, Department of Natural Resources
1974 to 1981	Instructor, part-time, Anchorage Community College and University of Alaska. Anthropology and Native American courses.
1976 to 1977	Consultant, Cultural Relations
1974 to 1982	Administrative Manager, part-time, Chamer Company, Inc., a general contracting firm.

COMMISSION MEMBERSHIP/PROFESSIONAL

National Conference of State Historic Preservation Officer
- Vice President, 1994 to present
- 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 1993
- 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 1994
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

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	PROPOSED FFY 1996 TRUSTEE AGENCIES TOTALS					
			ADEC	ADF&G	ADNR	USFS	DOI	NOAA
					$54.1		$20.3	
Personnel	$0.0	$50.8						
Travel	$0.0	$8.0						
Contractual	$0.0	$4.7						
Commodities	$0.0	$3.0						
Equipment	$0.0	$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$0.0	$66.5	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration	$0.0	$7.9						
Project Total	$0.0	$74.4	$60.0	$50.0	$0.0	$0.0	$0.0	$0.0
Full-time Equivalents (FTE)	0.0	0.7						
			Dollar amounts are shown in thousands of dollars.					
Other Resources	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

Comments: Project implementation following 1998 will transfer to the private sector with minimal agency involvement.

8/25/95 Version

1996

Prepared:

Project Number: 96149
Project Title: Archaeological Site Stewardship
Lead Agency: AK Dept. of Natural Resources

FORM 2A
PROJECT
DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS					
			Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
Personnel		$39.6						
Travel		$3.7						
Contractual		$2.7						
Commodities		$2.0						
Equipment		$0.0						
Subtotal	$0.0	$48.0						
General Administration		$6.1						
Project Total	$0.0	$54.1	$46.0	$40.0	$0.0	$0.0	$0.0	$0.0
Full-time Equivalents (FTE)		0.5						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

1996

Prepared:

Project Number: 96149
Project Title: Archaeological Site Stewardship
Agency: AK Dept. of Natural Resources

FORM 3A
AGENCY
PROJECT
DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
	Judith Bittner	Project Manager	21	1.0	7,100	0	7.1
	Doug Reger	Archaeologist II	18	5.0	6,500		32.5
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		6.0	13,600	0	
Those costs associated with program management should be indicated by placement of an *.						Personnel Total	$39.6

Travel Costs:		Ticket	Round	Total	Daily	Proposed
PM	Description	Price	Trips	Days	Per Diem	FFY 1996
	Travel to Homer to conduct site inspections of archaeological sites on the outer coast of the Kenai Peninsula.	180	4	20	150	3.7
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
Those costs associated with program management should be indicated by placement of an *.					Travel Total	$3.7

1996

Project Number: 96149
Project Title: Archaeological Site Stewardship
Agency: AK Dept. of Natural Resources

FORM 3B
Personnel
& Travel
DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:	Proposed
Description	FFY 1996
Air charters to visit site steards and inspect sites (8 hours @ $275/hour)	2.2
Film processing - site photographs	0.5
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$2.7

Commodities Costs:	Proposed
Description	FFY 1996
Field and Office Supplies (computer disks, toner cartridge, disposable camers , binders)	1.5
Gasoline for outboard motors	0.5
Commodities Total	$2.0

1996

Project Number: 96149
Project Title: Archaeological Site Stewardship
Agency: AK Dept. of Natural Resources

FORM 3B
Contractual & Commodities DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	Inventory Agency

1996

Project Number: 96149
Project Title: Archaeological Site Stewardship
Agency: AK Dept. of Natural Resources

FORM 3B
Equipment
DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996						
Personnel		$11.2						
Travel		$4.3						
Contractual		$2.0						
Commodities		$1.0						
Equipment		$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$0.0	$18.5	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration		$1.8						
Project Total	$0.0	$20.3	$14.0	$10.0	$0.0	$0.0	$0.0	$0.0
Full-time Equivalents (FTE)		0.2						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

1996

Prepared:

Project Number: 96149
Project Title: Archaeological Site Stewardship
Agency: Dept. of Interior, US Fish & Wildlife Service

FORM 3A
AGENCY
PROJECT
DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
	Charles E. Ditters	Regional Archaeologist	12	2.0	5,600	0	11.2
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		2.0	5,600	0	
Those costs associated with program management should be indicated by placement of an *.						Personnel Total	$11.2

Travel Costs:		Ticket	Round	Total	Daily	Proposed
PM	Description	Price	Trips	Days	Per Diem	FFY 1996
						0.0
	Travel to Kodiak to visit archaeological sites.	386	2	4	225	1.7
	Travel to Chignik to visit archaeological sites.	400	3	6	225	2.6
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
Those costs associated with program management should be indicated by placement of an *.					Travel Total	$4.3

1996

Project Number: 96149
Project Title: Archaeological Site Stewardship
Agency: Dept. of Interior, US Fish & Wildlife Service

FORM 3B
Personnel
& Travel
DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:	Proposed FFY 1996
Description	
Air charters to visit archaeological sites and site stewards. (5.5 hours @ $275/hour)	1.5
Film processing.	0.5
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$2.0

Commodities Costs:	Proposed FFY 1996
Description	
Field and Office Supplies (computer disks, toner cartridges, disposable cameras, film)	0.5
Outboard motor gasoline.	0.5
Commodities Total	$1.0

1996

Project Number: 96149
Project Title: Archaeological Site Stewardship
Agency: Dept. of Interior, US Fish & Wildlife Service

FORM 3B
Contractual & Commodities DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	Inventory Agency

1996

Project Number: 96149
Project Title: Archaeological Site Stewardship
Agency: Dept. of Interior, US Fish & Wildlife Service

FORM 3B
Equipment
DETAIL

96150

FROM: RICK KNECHT, 75203,1432
TO: Bob Loeffler, 73160,1771
DATE: 4/30/95 11:31 PM

Re: Yet Another

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

April 30, 1995

Dear Trustee Council,

I would like to respond to concerns expressed in the 'Invitation to Submit Restoration Projects for Federal Fiscal 1996', and to a draft of the '1994 EVOS Report Spill Area Site and Collection Protection Plan'. As noted in both these documents, the success of the Alutiiq Museum and Archaeological Repository project has generated a large number of proposals to build similar facilities in communites throughout the oil spill area.

We strongly support these various projects, for there is no better way to preserve endangered cultural and historic resources. We are also very aware, perhaps more than others, that there is a substantial and long term financial committment that a community must make in operating such a facility. Operations costs needed to meet federal standards for storing large collections are very high and probably prohibitive for communities smaller than Kodiak.

Therefore in the interest of making these various projects more financially feasible, and in an effort to make the best use of our existing facility, I am submitting the attached proposal idea for your consideration. We are suggesting that you fund converting existing basement space in Alutiiq Museum and Archaeological Repository into more artifact storage area. Selected artifacts would be displayed in other spill communities, where facilties or display areas could exist without the necessity of funding the staff and physical plant needed for large collections.

Of course the ideal is for all artifacts to some day go back to museums nearest their places of origin, but we believe that is a financial impossibility at this time. We think that the attached proposal may make the creation of local museums and displays more attainable for the smaller communities in the spill area.

Finding a reasonable balance of the public need for protection of archaeological resources, local access to cultural heritage, and fiscal responsibility is a challenge now before the Trustee Council. We hope this restoration idea is of use and are eager to work with any trustee agency in developing it further.

Sincerely,

Dr. Richard A. Knecht,
Director
EVOS Spill Area-Wide Artifact Repository title
A Restoration Idea Submitted to the EVOS Trustee Council
by the Alutiiq Museum and Archaeological Repository
215 Mission Road, Kodiak, AK 99615

Project Number:

Restoration Catergory:	General Restoration
Proposer:	Alutiiq Heritage Foundation
Lead Trustee Agency:	Suggest ADNR
Duration:	1 Year
Cost FY 96:	$535,000
Cost FY 97-02:	$0
Geographic Area:	Prince William Sound, Kenai Peninsula
Injured Resource/Service:	Archaeological Resources

ABSTRACT

Many communities within the EVOS area have expressed interest in museums. The cost of constructing such facilities in all these locations is prohibitive. The new Alutiiq Museum and Archaeological Repository, designed to hold collections from the Kodiak area, suggests expanding its existing facilities to hold collections from the remainder of the oil spill area.

Selected artifacts would be displayed in other spill communities, where facilties or display areas could exist without the necessity of funding the staff and physical plant needed for large collections.

INTRODUCTION

In 1993 the Trustee Council funded the Alutiiq Museum and Archaeological Repository, which opened to the public in May of 1995. The repository was designed to provide secure storage for artifacts and data recovered from archaeological sites in the Kodiak region.

As a result of the success of the Alutiiq Museum and Archaeological Repository project, numerous other communities from throughout the spill area have expressed an interest in developing similar repositories. We can assert, given our recent experience, that building facilities on the same scale as the Kodiak project would not make good economic sense. Operations costs needed to meet federal standards for storing large collections are very high, and probably prohibitive for communities smaller than Kodiak.

We suggest expanding our existing storage capacity so it can hold collections from the entire oil spill area. We have a basement space which was designed for eventual expansion which can be turned into state-of-the-art museum storage space very economically.

Museums typically display 10% or less of their collections, the majority of which are of great scientific value, but not visually interesting enough or in good enough condition for public exhibit. Small display areas, culture centers, or similar projects in communities throughout the oil spill area could store large

collections at the Alutiiq Museum and Archaeological Repository, while displaying selected pieces for public educational purposes.

In this way the Trustee Council could assist in regional presevation efforts in a way that gives local people access to their heritage, is economically sustainable, and affords the best protection for collections.

NEED FOR THE PROJECT

A. Statement of Problem

There has been a wide interest in artifact repositories and local culture centers as a means of preserving cultural resources damaged or threatened by the oil spill. Virtually every community within the spill area has expressed a desire for such a project. However while repositories certainly address archaeological damage issues effectively, they remain costly to build and maintain.

Finding a reasonable balance to the public need for protection of archaeological resources, local access to cultural heritage, and fiscal responsibility is a challenge now before the Trustee Council.

B. Rationale

The Alutiiq Museum and Archaeological Repository is seeking to assist the development of local culture centers and repositories in any way possible, for we believe strongly that they are the key to effective preservation of threatened archaeological sites. We encourage all those interested in developing such projects to come to Kodiak and see first hand the costs and benefits involved. We expect to serve as a training ground for personnel to man preservation efforts throughout the spill area

While fully aware of the great benefits this project has for Native heritage and our community, we are equally aware of the financial committments we have made in undertaking the long term operations costs involved. We would strongly encourage all communities interested in museums to take a financial reality check to insure the long term viability of their plans.

Our operations budget will be about $300,000 annually. Most of this can be attributed to the need to meet federal standards for curation of artifacts. The electricity for the climate control equipment alone will cost an estimated $18,000 in FY 96. Highly trained staff are also required. Smaller facilities may be planned, but if they are to meet these standards they will not be substantially cheaper to operate. Even given the availability of outside grants, a critical mass of community support is needed and fortunately Kodiak is just large enough for this to exist.

Through this project we propose to purchase the basement space in our building and install climate control equipment and storage shelving units to hold collections from the Kenai Peninsula and Prince William Sound. We can then store collections belonging to other entities in the spill area that may be planning culture centers or locally based displays. They can design a project around a manageable number of artifacts instead of attempting to store and curate every artifact ever recovered from their region.

The ideal of course is for every collection to be stored as close as possible to its point of origin. We believe that the Alutiiq Museum and Archaeological Repository is the nearest full scale facility which is financially sustainable in the oil spill area for the forseeable future. The need for local displays can be met by rotating pieces through small local, relatively inexpensive centers. This may range from small museums to interpretive displays in a village school.

For scientific purposes it also makes sense to centralize the collections and data at the Kodiak facility so that scholars and cultural resource managers can have the materials they need in one place. Fruitful comparative data is already emerging from the newly gathered collections at the Alutiiq Museum and Archaeological Repository.

C. Summary of Major Objectives

The building was developed by Natives of Kodiak, Inc. in cooperation with the Kodiak Area Native Association (KANA). Occupying the first floor of the center is the 6,000 square foot Alutiiq Museum and Archaeological Repository with office suites for Natives of Kodiak Inc. and Afognak Native Corporation on the second floor. A basement space of 1,670 square feet is available for purchase from Natives of Kodiak, Inc. This would increase the available storage space for artifacts by 150%.

The basement space would be enclosed by metal stud framing and gypsum wallboard with special vapor barriers. Ducting and fire control equipment would also be installed. A Liebert climate control unit, matching the two already installed in the facility wll control temperature and humidity within a 1% range. Space-saver storage units would be installed as they have been in the upstairs of the existing facility. Utility spaces and connections have already been designed and installed in the Alutiiq Museum and Archaeological Repository with this expansion in mind.

The storage space would then be reserved on a first come, first served basis for other communities within the oil spill area. The Alutiiq Museum and Archaeological Repository will provide all the needed curatorial staff and other support to care for the collections using its own funds. Special collections needs, such as conservation and specialized storage materials can be addressed in cooperation with the collection owners. The Alutiiq Museum and Archaeological Repository does not seek ownership of the collections under its care, unless the owner wishes to make a donation. The bulk of the collections are now cared for under curation agreements and we expect this to be the case in the future.

D. Completion Date

The improvements to the basement space needed are relatively simple and can be made within six months of project approval. We would expect the new storage space to be fully operational by June of FY96.

COMMUNITY INVOLVEMENT

The Alaska Department of Natural Resources, Office of History and Archaeology has taken the lead in collating and reporting on the status of archaeological restoration efforts and needs in the spill area. We would expect to work closely with ADNR in coordinating with those planning locally based preservation centers and recovery efforts. The object of the project is to make everyone's project cost effective, and therefore more likely to be successful in the long term. Teamwork is the key to making the very best use of the funds allocated to restoring damaged cultural resources.

The Alutiiq Museum and Archaeological Repository staff has, and will continue to offer free consultative services to any in the spill area planning local culture centers. We spent 12 years in planning the current facility, begining long before the spill, and have learned much that will be of use planning efforts. We are eager to work in cooperation with any agency seeking to assist others in locally based preservation projects.

FY 96 BUDGET

Personnel		0
Travel	0	
Contractual		415.0
Commodities	0	
Equipment		120.0
Subtotal		535.0
Gen. Admin.	0	
Total		535.0

EXXON VALDEZ TRUSTEE COUNCIL
FY96 PROJECT DESCRIPTION

Expansion of the Prince William Sound Science Center/Oil Spill Recovery Institute.

Submitted under the BAA #50ABNF500082

Project Number:	96151-BAA
Restoration category:	Research Facilities
Lead Trustee Agency:	NOAA
Cooperating Agencies:	Prince William Sound Science Center
Duration:	Four years
Cost FY96:	$3,000,000
Estimated Cost FY97	$6,000,000
Estimated Cost FY98	$2,000,000
Estimated Cost FY99	$1,000,000
Geographic Area:	Prince William Sound
Injured Resource/Service:	Basic marine research infrastructure important to the long term restoration effort.

ABSTRACT

This project addresses the need for basic marine research infrastructure important to the long term restoration effort of Prince William Sound (PWS). The research facility will be maintained by the existing Prince William Sound Science Center who administers the Oil Spill Recovery Institute, Hazardous Substance Spill Technology Review Council, and houses the "Science of the Sound" education and outreach program and core projects in the "Sound Ecosystem Assessment" (SEA) program funded by the Trustee Council. This project will expand currently overcrowded research facilities and provide new capacity for research and monitoring of ocean processes, marine plankton and nekton, and interrelationships between physics and the biology of the Greater Prince William Sound region. The Science Center's new laboratories will emphasize remote sampling (underwater acoustics and optics), data communication, visualization and numerical modeling to monitor ecosystem level processes.

The new facilities will be supported by long term operations of the Oil Spill Recovery Institute and indirect costs derived from the Science Center's public education and research programs. The facilities plan is integrated with the community's needs for development in Cordova's "old harbor" area and was

endorsed unanimously by the Cordova City Council, as well as the City's Harbor Commission, Port and Economic Development Council and Planning Commission. The City Council unanimously agreed to provide the harbor property needed for the development of this facility. This project is multi-phased over a seven year period and seeks several sources of funding for completion.

INTRODUCTION

The Science Center was established in 1989 as an independent research, monitoring and educational institution with the mission to contribute to a better scientific understanding of the Prince William Sound ecosystems. A primary goal is to maintain a comprehensive database on the Sound's natural resources and provide this information to users, managers, and the general public through education and outreach programs. Initial funding of the Science Center came from grants from the Murdock Foundation, Pew Charitable Trust, Conservation International Inc., Ecotrust Inc., the Alaska legislature, the City of Cordova and many private donations from the Prince William Sound Community.

The research program currently underway at the Science Center uses an ecosystem-level, interdisciplinary approach to understand the prominent physical and biological processes that control the dynamics of key animal populations of the Sound. The research and monitoring are prioritized by a science plan that was developed by agency, users, scientists and the public. Implementation of the program involves pooling of technical resources of the Science Center with state and federal agencies, universities and the public (especially local fishermen and Alaska Natives) to collect a broad spectrum of information on the greater Prince William Sound region. Field sampling is guided by the need to test hypotheses, and initialize, build and verify numerical models.

Sustaining the use of exploited natural resources in an ecosystem requires an active exchange of information between resource users, researchers, management and the public. The Science Center works across the turf boundaries that separate these groups to encourage the development and implementation of long-term, science plan. The involvement of long-time residents of the Sound, Alaska Natives, and others in the planning efforts provides knowledge of what constitutes "good or bad conditions" in the ecosystem. This knowledge helps to establish a meaningful definition of environmental health, which is a prerequisite for establishing the goals of the science plan. The sharing of information with the public promotes the cooperative exchange necessary for broad spectrum ecosystem research.

Using these approaches, the Prince William Sound Science Center has grown into one of the leading marine research organizations in Alaska today. With a diverse staff of research scientists and the latest in scientific equipment, the Science Center is developing better tools for research and monitoring of the renewable natural resources. The Science Center's research staff is providing an integral part of the Sound Ecosystem Assessment (SEA) research program in the use of remote sensing and its applications to more accurately estimate animal abundance. In addition, Science Center staff are developing data visualization tools to display complex ecosystem processes in an animated, yet simple format which does not sacrifice the quantitative quality of the data. Examples of the visualization of quantitative information are given in Figures 1-3[1]. The visualization gives researchers a better way to educate the public on

[1]Figure 1 and Figure 2 show sampling efforts in Prince William Sound; Figure 3 shows pollock densities in the Wells and Perry Island passages, as they are regridded into the bathymetry model of the Sound.

ecosystem processes. Understanding ecosystem processes is fundamental to refining management, restoration, and scientific goals, in addition to more esoteric concepts such as the definition of ecologically sustainable yields.

For three years, state and federal governments have used the services of the Science Center to administer the Hazardous Substance Spill Technology Review Council and the Prince William Sound Oil Spill Recovery Institute (OSRI). Both entities were established to provide the best available information on oil spill prevention and response. Funding of the Oil Spill Recovery Institute in FY96 will require increases in the current staff at the Science Center as we implement its programs. The Institute has developed models for spill transportation (Figure 4), oil spill prevention through risk assessment (Figure 5) and damage assessment minimization through modeling (Figure 6). These models have been used to develop a strategic plan for oil pollution technology, research and development.

The SEA and OSRI programs described are just two of several programs that are on-line or coming on-line that will increase the capability and size of our staff. Since we have already outgrown our current building, this proposal respectfully requests partial funding to expand our facilities in the Cordova harbor .

NEED FOR THE PROJECT

A. Statement of problem

In 1989-90, the City of Cordova gave the PWS Science Center a ten year lease on its current building and a $100,000 loan to begin operations. The loan was forgiven when the Science Center raised more than $250,000 to renovate the facility. Through 1993, the Alaska legislature contributed $577,000 in capital funds to help build the Science Center facilities. In 1994, the Science Center staff increased by 16 full time positions with the funding of the Sound Ecosystem Assessment program by the Trustee Council. This expansion required that we acquire additional space, now rented from the Orca Cannery, located about 2 and 1/2 half miles north of the Science Center's main facility. About the same time, the Science Center's *Science of the Sound* education program expanded to include an outreach program to PWS communities and a science summer camp. These programs are totally supported by private and federal grants. We currently anticipate full funding for the Oil Spill Recovery Institute to commence in FY96. Additional new major programs we expect to initiate in FY96 are the fish offal (waste) and sentinel fisheries research programs. These projects employ new technologies to solve applied problems that plague coastal marine communities of Alaska.

B. Rationale

The Trustee Council has authorized funding to support the construction of research facilities in the coastal communities that were affected by EVOS. The Science Center has worked with the local public and the Trustee Council to develop strategic plans for research in the Sound. Scientific innovation is the heart of the Science Center's program. Working with agencies, universities and the local public we have defined an ecosystem approach to prioritize fisheries research in the Sound. The Ocean Ecosystem Program of the National Science Foundation (NSF) endorsed the increased use by researchers of acoustic and optical remote sensing technologies which result in better measurements, as well as the use of

optimum sampling designs to reduce error and costs of collecting data, and advanced visualization techniques to translate science into easily understood images. The Science Center's research programs have adopted this NSF-endorsed philosophy.

As fast as we produce new information, it is assimilated into the management, restoration, scientific and public aspects of the PWS community. We expect the methods and information developed by the Science Center's program for EVOS concerns to have far-reaching influence with state, national and international interests. Investment into this program has and will continue to return manyfold.

Cordova was one of the most severely impacted of EVOS communities because of its dependence upon the fisheries resources in the Sound. The Science Center program has grown because of the local needs for better information. The intense interest in our research programs is evidenced by the constant public inquiries about the status of the herring, pollock, cod, salmon and other marine populations in the Sound. The Science Center was founded to provide independent scientific services to the communities of Prince William Sound, so it was logical to include the communities' needs and endorsements for expansion of the facilities. The funds that we now request are an investment in the future of Cordova, the Sound, and Alaska.

C. Summary of Objectives

The primary objective is to build a community research, monitoring and education facility that will comfortably house our existing staff and provide space for the developing Sound Ecosystem Assessment Program, Oil Spill Recovery Institute, *Science of the Sound* Education and Outreach Program and other newer programs such as the fish waste recycling and sentinel fisheries programs. This support will allow us to continue to attract high-caliber researchers from around the globe to our expanded facility, to collect information valuable to the management, restoration and ecological understanding of Prince William Sound's vital resources.

This will be accomplished by writing planning documents and raising matching funds, conducting site preparation, constructing the new buildings, and finally developing the research laboratory.

D. Completion Date

The project will begin in fiscal year 1996 with the planning and fund raising and will be completed in 2000.

COMMUNITY INVOLVEMENT

The facilities expansion plan is integrated with the community's needs for improved harbor facilities, public meeting/conference and education facilities, and exhibition space for displays on regional programs. Public input received during the EVOS Trustee Council Research Priorities workshop (April 1994) have been incorporated in this expansion plan. The Science Center received unanimous support from the City's Port and Economic Development Council (Attachment 1). The Cordova City Council also passed a resolution to provide the property for the expansion of facilities (Attachment 2). And, the

City's Planning Commission and the Harbor Commission both unanimously endorsed the harbor development plan which recommended the Science Center's expansion plan.

In addition to the need for improvements in the facilities for collection of scientific data, the following points were incorporated into the preliminary design by our architects:

- improvements to the harbor jetty which will reduce the winter north wind swells from entering the harbor and damaging harbor floats,
- increased off-street parking for the old harbor area,
- additional large vessel docking,
- enhancement of the boat-grid,
- availability of public meeting/conference facilities,
- improved education classroom and exhibit space,
- and, a public display area for use by various organizations for exhibits of regional fish and wildlife and other regional programs

We will provide continued opportunities for the involvement of subsistence users and the Native community to contribute to decisions about the facilities design. We welcome further public input and anticipate opportunities to talk with members of the public at EVOS Trustee Council sponsored workshops and the Prince William Sound community.

FY96- FY99 BUDGET

	EVOS Trustee Council	Matching	City of Cordova	Total
Contractual	10,125,000	18,200,000		29,000,000
Facilities			557,000	557,000
Land			135,000*	135,000
Indirect Costs	1,875,000			1,200,000
Total Costs	$ 12,000,000			$ 31,892,000

* The property value is calculated at the higher upland property rate because the facilities expansion plan includes filling the tideland.

PROJECT DESIGN

A. Objectives

1. Development of a business plan

   Business plan development includes development of detailed long-term maintenance plans and projections, development of a strategic plan to raise matching funds and project future spending.

2. Environmental Impact Statement (EIS)/Environmental Assessment (EA) development and permitting.

   We will use the same plan for development of the tidelands as the State Department of Transportation (DOT) used for expansion of a nearby ferry terminal area. This required permitting from the U.S. Army Corps of Engineers.

3. Development plans for facilities expansion

   The first rendition of the expanded facilities is completed (Figure 7). Following public meetings, a second rendition will be completed.

4. Implementation of plans

   Site preparation and construction and equipping of the facility.

B. Methods

We have formed a team of architects and planners to develop the new facilities. Our long range building plans will cost about $30 million, which we plan to raise from a number of sources. Several of the features that relate to community needs such as harbor improvements, public display areas, lecture/meeting rooms and library facilities have more appropriate sources for funding than the EVOS Trustee Council. A detailed copy of the draft facilities improvement program is included (attachment 3).

C. Contracts and other Agency Assistance

The City of Cordova has dedicated the undeveloped harbor area surrounding the present building for the expansion of the Science Center facilities. We plan to phase this development and seek several sources of funding where appropriate. As an example of this, the installation of a new jetty along the north harbor entrance is part of the facilities expansion plan. Since the new jetty will improve the existing harbor facilities, we plan to request support from the Army Corps of Engineers and the Coastal Zone Management Council. The Science Center is also seeking support from private foundations which specialize in science and educational facilities development.

D. Location

The Prince William Sound Science Center is located at the entrance to Cordova's boat harbor, in eastern Prince William Sound. Cordova, one of the most economically and socially affected areas in the EVOS impact area, will benefit from this development.

SCHEDULE

A. Measurable Project Tasks for FY96

Start up to six weeks:	The business and development plans will be initiated following public meetings.

At three months:	A NEPA determination will be made by the Army Corp of Engineers and the appropriate permitting will be sought for the project.
At six months	Completion of a second rendition of the development plan.
At nine months	Completion of strategic plan for funding and detailed long term maintenance plan.
At twelve months:	Army Corps permit in place, EIS/EA complete.

B. Project Milestones and Endpoints

FY96:	Business and development plans completed. All permitting completed and initial site preparation begun and fund raising continued.
FY97:	Competition of site preparation and initial construction begun.
FY98	Completion of construction and initial equipping of laboratories.
FY99	Finish laboratories
FY00	Project closeout.

C. Project Reports

By April 15th of each year, an annual report will be submitted on the milestones reached in the previous funding year. The FY96 report will discuss progress made toward completion of each objective. While this project will not have any project results to publish in peer-reviewed journals, projects supported by the facility will have published results.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

The Prince William Sound Science Center has provided coordination and integration of SEA projects since the inception of the SEA program. The expansion project described in this proposal will provide continued support of SEA programs, and a platform from which field programs can operate. Laboratory space will be used by Science Center staff as well as local and visiting scientists. For instance, the ADF&G is currently using our existing laboratory space for processing samples collected by SEA projects. Under the planned expansion there will be ample space for SEA scientists to work cooperatively in the proposed wet laboratory facility.

ENVIRONMENTAL COMPLIANCE

The proposed expansion project will require filling of tidelands. Permits will be required from the U.S. Army Corps of Engineers, and the Coastal Zone Management Commission. We will follow the same procedure as the State DOT used for expansion of a nearby ferry terminal area for obtaining an CE for the project. NEPA review for the ferry terminal and dock construction was done by the U.S. Army Corps of Engineers.

PERSONNEL

The Science Center's Board of Directors established a facilities committee. The committee includes the following members:

Nolan Watson, *Consultant, McClellan & Copenhagen, Inc., Seattle*
Scott Janke, *City Manager, City of Cordova*
R.J. Kopchak, *PWS drift gillnet fisherman, Cordova*
Gary Thomas, *President, PWS Science Center*

See attached C.V.'s for qualifications.

G L Thomas by Nancy Bird

Gary Thomas, Principal Investigator
Prince William Sound Science Center
Box 705, Cordova, AK 99574
(907) 424-5800; fax (907) 424-5820
loon@grizzly.pwssc.gen.ak.us

Byron Morris, Project Manager
National Oceanic & Atmospheric Administration
Department of Commerce

Resumes, construction information, and photos available from the restoration office.

Prepared: April 26, 1995

Port and Commerce Development
Advisory Board
Agenda 2/07/95

PORT AND COMMERCE DEVELOPMENT ADVISORY BOARD
CORDOVA, ALASKA

RESOLUTION 01-95-06

A RESOLUTION FROM THE PORT AND COMMERCE DEVELOPMENT ADVISORY BOARD OF THE CITY OF CORDOVA, ALASKA IN SUPPORT ON THE PROPOSED EXPANSION OF THE PRINCE WILLIAM SOUND SCIENCE CENTER.

WHEREAS, the Port and Commerce Development Advisory Board has reviewed the proposed Expansion Plan of the Science Center at the Port and Commerce Development Advisory Board meeting of Tuesday, February 7, 1995; and

WHEREAS, the Port and Commerce Development Advisory Board is in support of adopting the Waterfront Master Plan;

WHEREAS, the Port and Commerce Development Advisory Board is in support of the concept of the Prince William Sound Science Center proposed expansion in the Waterfront Master Plan;

WHEREAS, the Port and Commerce Development Advisory Board supports siting the facilities at their present location with expansions towards Breakwater Avenue and the Coast Guard Dock;

NOW, THEREFORE, BE IT RESOLVED, that the Port and Commerce Development Advisory Board asked the City Council to support the Science Center Expansion Project, and to make available these property sites for long-term lease to the Science Center, to show potential sponsors of the development that Cordova fully supports this project.

PASSED AND APPROVED THIS 7th DAY OF FEBRUARY 1995.

Kim Ewers, Chairman

Nancy Patson, Secretary

for Nancy Patson

CITY OF CORDOVA, ALASKA

RESOLUTION 2-95-13

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CORDOVA, ALASKA

WHEREAS, the Prince William Sound Science Center is an integral part of the economy of Cordova and contributes to the base of knowledge needed to effectively manage the natural resources on which we depend; and

WHEREAS, the Science Center has outgrown its building and requires additional space for the expansion of its facilities to better meet its Mission; and

WHEREAS, the needs of the Science Center, and other needs of the community can best be met by a coordinated effort for facilities development; and

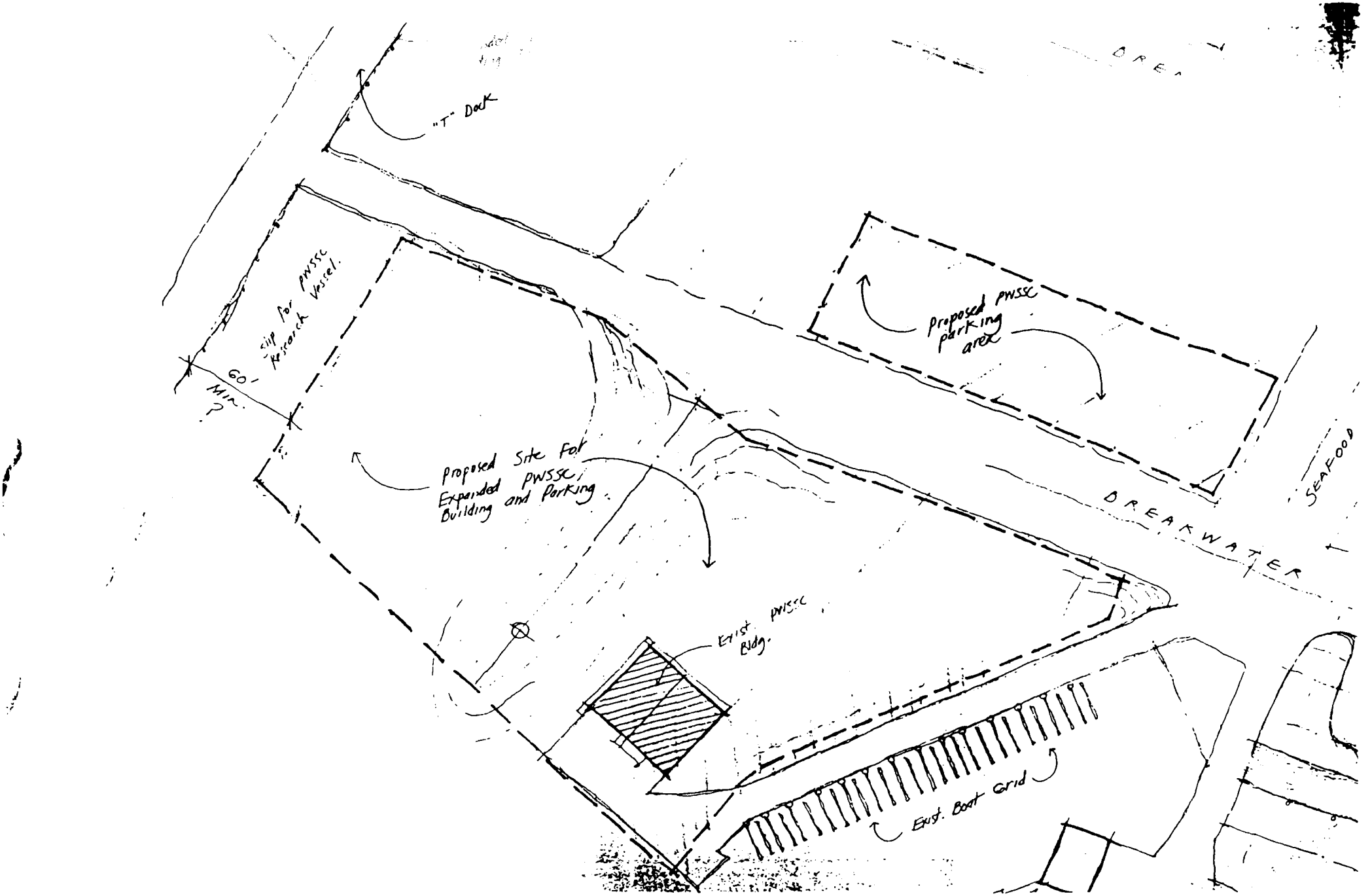
WHEREAS, the Harbor Commission, the Planning Commission, and the Port and Commerce Commission have reviewed the preliminary development proposals for the Science Center and found them to be responsive to the needs of the Science Center and the City of Cordova;

NOW, THEREFORE, BE IT RESOLVED that the City of Cordova set aside and designate the area located within the Tidewater Development Park, as shown on the attached map, as a special Economic Development Zone, and that this area be used to fulfill the needs of the Science Center and the City of Cordova for expanded facilities.

PASSED AND APPROVED THIS 16TH DAY OF FEBRUARY, 1995.

Neil Schultz, Vice-Mayor

Lynda Plant, City Clerk


"T" Dock
Slip for PWSSC Research Vessel.
60' Min.
Proposed PWSSC parking area
Proposed Site For Expanded PWSSC Building and Parking.
BREAKWATER
SEAFOOD
Exist. PWSSC Bldg.
Exist. Boat Grid

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS					
			Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
Personnel		$0.0						
Travel		$0.0						
Contractual		$2,625.0						
Commodities		$0.0						
Equipment		$0.0						
Subtotal	$0.0	$2,625.0						
Indirect		$375.0						
Project Total	$0.0	$3,000.0	$6,000.0	$3,000.0	$1,000.0			
Full-time Equivalents (FTE)		0.0						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Indirect costs are calculated at 12.5% of the total to manage the project..

1996

Prepared:

Project Number: 96
Project Title: Expansion of the Prince William Sound Science Center/Oil Spill Recovery Institute Facilities in Cordova, Alaska
(also submitted under the Broad Agency Announcement)
Name: Prince William Sound Science Center

FORM 4A
Non-Trustee
DETAIL

96152

LETTER OF TRANSMITTAL

To: **Exxon Valdez Oil Spill Trustees Council**
EVOS Restoration Office

From: **Jim Sinnett, Program Planner**
Chugach Heritage Foundation

Date: **May 1, 1995**

Re: **Final draft submission of EVOS FY-96 Project Application**

Project Title: **Community Museum, Repository, Archaeological, Site Stewardship, Co-Management Training & Human Resource Development Project**

Proposer: **Chugach OSIR Communities Consortium**: A Consortium of the Oil Spill Impacted Region (OSIR) Villages and Alaska Native Communities of Chenega, Tatitlek, Port Graham, Nanwalek, Eyak , Seward, and Valdez

Project Originator: **The Native Village of Eyak Tribal Council**

The following Project Application is submitted under authorization and on behalf of the participating Chugach region oil spill impacted communities. The project purposes were arrived at through discussion and consensus of the participating communities. It is expected that the project details will continue to be refined through the EVOS review process and EVOS negotiations with the participating communities. Chugach region communities, not having already done so, are to provide project application submission authorization letters by May 29, 1995. Final Resolutions of participation will be considered for adoption after review of the project as finally negotiated with the EVOS Trustees Council.

A detailed line-item project budget, prepared on the "Excell" software program, will be submitted after initial review is completed by the EVOS Restoration Office.

Project Title:	**Community Museum, Repository, Archaeological, Site Stewardship, Co-Management Training & Human Resource Development Project**
Project Number:	96152
Restoration Category:	General Restoration
Proposer:	**Chugach OSIR Communities Consortium**: A Consortium of the Oil Spill Impacted Region (OSIR) Villages and Alaska Native Communities of Chenega, Tatitlek, Port Graham, Nanwalek, Eyak , Seward, and Valdez
Project Originator:	**The Native Village of Eyak Tribal Council**
Lead Trustee Agency:	Department of the Interior: Forestry Service / National Park Service
Cooperating Agencies:	Alaska Department of Natural Resources, Department of Fish and Game, Department of Community & Regional Affairs
Regional Assistance:	Chugachmiut, Chugach Regional Resource Commission, Chugach Heritage Foundation, Chugach Alaska Corporation
Duration:	Multiple year / Four (4) year "seed" project - FY 1996 to FY 1999
Cost FY 96:	$190,300
Cost FY 97:	$190,300
Cost FY 98:	$190,300
Cost FY 99:	$190,300
Geographic Area:	Chugach Oil Spill Area Wide: a Service Delivery Area inclusive to all unincorporated and Alaska Native subsistence communities within the Chugach oil spill impacted region.
Injured Resource/Service:	Archaeological & Subsistence Resources: All Injured Resources / Service

ABSTRACT

The **Chugach OSIR Community Museum, Repository, Archaeological, Site Stewardship and Co-Management Training and Human Resource Development Project** purposes are to provide a comprehensive and cost effective / efficient approach to the provision and delivery of museum, repository, archaeological, site stewardship and resource co-management training and career development, for 14 to 21 local residents, or 2 to 3 participants from each Chugach OSIR community engaged in the development of a cultural center, or a subsistence restoration, site stewardship, and/or resource co-management facility, or attendant local service enterprises. Provision for trained (training) personnel is a prerequisite to the certification of repository facilities, for the curation federally owned and administer archaeological collections (36 CFR Ch. 1 (7-1-92 Edition) Part 79). Trained and qualified personnel is a prerequisite to local contracting assumption under P.L. 638 and attendant CFR regulations of the U.S. Department of Interior.

The project design is to meet CFR requirements and other applicable standards for facilities and provision of qualified staff therein. The project design is to facilitate and carryout a coordinated and region-wide effort and assure provision for the various elements associated with and necessary to the training and education for local residents, dislocated by the oil spill impact from their traditional occupations and means of subsistence; and who will most likely be engaged to manage and operate community cultural centers, artifact repositories, subsistence restoration - natural resource co-management facilities; and who will most likely staff their local areas' - repository, site stewardship, co-management - programs, services and enterprises.

Introduction:

One significant part of the oil spill impact was the disruption and dislocation of traditional local occupations, subsistence economies, artifacts, and ways of cultural preservation. But, the impact also clearly created new occupational and local ecnomic opportunties, means for cultural preservation, and demands for the timely repatriation of artifacts. Unquestionably, the oil spill exasperated a need for new skills training and educational development for local residents, in several professional fields associated with the restoration efforts, including preservation of historical / cultural artifacts, site stewardship and resource co-management.

Being similarly impacted, each of the Alaska Native communities within the oil spill impacted Chugach region now shares a common-need and requirement for the provision of new and varied training and career field exposure to: e.g., archaeology, curation, site stewardship, natural and subsistence resource co-management. As a seed effort, the project is to provide local residents with immediate opportunity for field training, internship placement and career exposure; and assist in the development of an accredited curriculum and training program component, for integration within the existing Chugach regional and local community training program structures.

This project proposal requests the continued commitment of the EVOS Trustee Council to cutural and subsistence restoration, through funding support for a four year "seed project" to develop and implement an accredited training and career development program for local residents. The EVOS seed funding will be matched with other appropriate funding and program resources available to the local tribes and region. The project would also be carried out in conjunction with the current development of region-wide local tribal management opportunities funded and contracted for under P.L. 638, as amended for tribal compacting, and the newly established Alyeska - Sec. 29 - Alaska Native Training and Internship Program.

The project will secure the curriculum development, classroom educational and field training service involvement of other key institutions and organizations, e.g. the University of Alaska, the Smithsonian Arctic Studies Center, the Kodiak Alutiiq Archaeological Repositroty Center, the Anchorage Museum, etc.. Federal and state agencies, i.e., U.S. Forestry Service, National Parks Service, Department of Natural Resources, Divisions of Parks and Outdoor Recreation, will also be engaged to provide technical assistance for curriculum development. The project will use Forestry and Park Service - Site Stewardship and Curation guideline materials to provide immediate direction in this field of training curriculum development.

To meet the requirements of 36 CFR Part 79, adequate training of personnel is mandatory. Participants will be engaged in selective training and internships that could range from two weeks to nine months, or more, in duration. Through a cooperative effort with the Chugach regional and village corporations, trainees will participate in the (14h) survey of archaeological and excavation sites, primarily within the oil spill impacted Chugach region. This site training approach will provide trainees and their communties with an understanding of the preservation needs within the region and assist in establishing viable local site stewardship. Locally based and managed research, excavation, and curation should be considered as the cost-effective way and means to address the concern for long-term cultural resource preservation within the communities of the Chugach Region . The training project will provide a coordinated means for assuring immediate response to the existing needs of site identification, ongoing monitoring, protection from erosion and vandalism and conservation of artifacts, each of which are crucial to the preservation of the cultural heritage of the Chugach region. The seed project will assure an immediate cadre of trained residents, dedicated to preserving the history and heritage of their community and region. Fully trained residents will povide their community with the long-term capacity too oversee, manage, and operate local facilities; and be fully responsible for local site stewardship and resource co-management.

NEED FOR PROJECT

A. Statement of Problem

Chugach region communities and their residents are accutely aware of the oil spills' impacts upon the traditional control and management of local resources; as well as, the impacts resulting from public exposure of historical archaeological sites and the subsequent removal of cultural artifacts. The oil spill impacts included the displacement, or dislocation, of traditional occupational economies, traditional means of local resource stewardship, and traditional ways for preservation of cultural historical sites. The oil spill pre-empted the traditional ways and occupational means of local resource stewardship and cultural preservation, and in it's wake subsituted use of traditional knowledge with the imposition of unfamiliar mandates and requirements upon the communities to comply with a variety of restoration policies and governmental regulations, standards and conditions for e.g. curation of archaeological collections, site stewardship, and local resource co-management.

Yet, while a potpourri of mandates and requirements have emerged, there is little formal recognition of or integration with traditional use knowledge and local resource stewardship skills. Nor, does there currently exist a meaningful and coordinated effort too augment these traditional assets with provision for accredited training and career development opportunities. The disruption of traditional occupations and local economies, dislocation of artifacts, and regulatory compliance conditions brought about by the oil spill now require and necessitate local acquisition of new occupational skills through training and higher education. To accomplish this, the oil spill impacted communities recognize the need for an immediate region-wide cooperative effort between the communities, the EVOS Trustee Council, and other appropriate agencies, to assure provision of adequate museum, repository, archaeological, site stewardship and co-management training.

A result of the oil spill has been increased public knowledge of archaeological and subsistence resource sites. In the long-term and to sustain the results of the restoration efforts, only the local community presence and involvement can assure preservation of historical cultural sites and the use of traditional knowledge for continued local resource management. The impacts of the oil spill now necessitate provision of training and higher degree educational opportunities for residents, to augment thousands of years of traditional knowledge and assure continued local resource stewardship. Traditional local resource stewardship was disrupted and local artifacts were removed during the oil spill. As a result, immediate artifact repatriation and continued site stewardship is dependent upon each community meeting certain contemporary facility and training standards, regulations, and other general conditions that have been imposed upon the local communities by outside authorities. There are a very limited number of local residents vocationally trained, or with higher degrees, in the various fields of expertise employed in the restoration efforts. In consideration of the scale of economies associated with the undertaking and delivery of training and career development services to the several communities, and to assure each community and local residents have an equal opportunity to participate and benefit, a region-wide and coordinated approach is required and considered the most cost-effective approach.

Archaeological sites throughout the Chugach region were affected by oil from the EVOS clean-up effort. The EVOS Trustee Council has funded projects to restore sites injured by the clean-up workforce, vandals, and looters. Using imported expertise and local residents with limited training, restoration efforts have included replacing the disturbed cover and erosion control. However, artifacts removed and sent to the University of Alaska Fairbanks, and other locations outside the Chugach region, for custodial care, cannot be fully repatriated until construction of appropriate facilities and adequately trained personnel are in place.

B. Rationale

The EVOS Trustee Council approval of this proposal will be a clear demonstration of commitment not only to the overall restoration efforts, but in particular the near-term repatriation of artifacts and the long-term preservation of the cultural heritage of the Chugach region peoples. The project will be a demonstration of the region's and local community commitment to work with the Trustee Council to ameliorate the long term cultural, occupational, and subsistence damages resulting from the Exxon Valdez oil spill.

For the long-term, only the local community presence and involvement can assure preservation of historical cultural sites, and use of traditional knowledge for continued local resource management. Training and higher education can assure the meaningful local use of survey, research and scientific knowledge gathered through the EVOS Trustee Council restoration project efforts. At the conclusion of the formal restoration effort (2002), the communities will again be responsible for local resource management, assuring preservation and enhancement of the Trustees Council's restoration accomplishments.

Local resident training is essential to the transfer and use of such fields of knowledge. Without training and higher education opportunity, research and scientific knowledge is less likely to be understood and employed in the long-term maintenance of restoration effort results. Without the provision for resident training and career development, local communities will continue to be dependent upon costly outside sources and skills for interpretation and use of the research and scientific knowledge. Understanding of the research and scientific data is essential to the local communities in their effort to meet the new standards required of them in order to regain local site stewardship and resource co-management, and the repatriation of removed artifacts. Provision must be made for resident training and community capacity building.

Presently there are several hundred known artifacts that were collected from numerous sites during the oil spill clean-up period and which are now being stored at locations outside the Chugach region. Many of these sites and artifacts have been documented by video, orthoquad maps, and other records. It will serve the public and local community interests to have these artifacts and records returned to the region and locales from where they were removed. The proposed training and career development project for residents is a prerequisite to return of the removed artifacts - too local control and curation management

Artifacts and records have been removed or stored at such a distance from the region and communities, that local people cannot readily afford the travel necessary to first-hand viewing and study from which they learn about their culture. In order for these items to be returned, adequate local and regional facilities (scaled to the needs of each community) are required. A prerequisite for operating (36CFR Part 79) repository facilities, is trained personnel. If the tandem project proposal for facilities is to proceed, there must a concurrent commitment to assure adequately trained personnel to operate and maintain those facilities when they are constructed, according to standards under CFR Title 36 Part 79.

The coordinated region-wide approach of this project proposal represents the best and most cost effective and efficient means training, internship, and career development services. The approach will allow the participating local communities to benefit from existing and future partnerships with their regional organizations, school districts, higher education, and job training institutions serving the region; with whom the local communities have a long-standing service relationship. With resources available under P.L. 638 tribal compacting, Alyeska Sec. 29. Alaska Native Training Program, other federal and state job training programs, and educational foundation scholarship programs, the tribal communities and their regional service organizations will be able to provide in-kind and funding match to the EVOS Trustee Council's support.

C. Summary of Major Hypotheses and Objectives

The project offers a ways and means for the impacted communities to recover from cultural trauma suffered due to the oil spill. The project will support a coordinated effort to regain and enhance local capacity, too preserve restoration accomplishments and assure qualified disaster response in the future. Among the injuries suffered were oil contamination, vandalism, looting, descreation and disturbance of archaeological and cultural sites, and dislocation from traditional local occupational economies. Prior to the oil spill these sites were confidential, undisclosed, and intact. The project intends to involve all oil spill impacted communities. The Chugach region communities have demonstrated continuing commitment to preserving their unique cultural values, traditions, heritage and future as ongoing and viable Alaska Native communities.

Through partnership commitment with the region's community service organizations, - administration, accounting, technical assistance, and other direct program support will be provided to the consortium of Chugach communities. Recognizing the constraints and scale of economies, regional support services will help assure that the project can be successfully accomplished in a timely , cost effective and efficient manner. The communities, in consortium and cooperative effort with their regional service organizations and educational institutions, can meet the following community capacity builiding and training objectives:

1. **Accredited Training:** A region-wide partnership accredited training program for local residents in the fields of archaeology, curation and repositories, site stewardship, natural resource and habitat co-management;

2. **Site Stewardship & Resource Co-Management:** Protection and mitigation of damages to archaeological and cultural sites on or associated with oil spill impacted communities within the Chugach region; and natural resource and habitat co-management;

3. **Archaeological Survey:** Plan, manage, conduct and assist in discovering additional unknown sites and/or survey completion of known sites.

Approach

The contemplated work plan, to be refined through the EVOS review process, will cover a four year period that carries training participants through structured vocational training and provides exposure to higher degree career opportunities. The success of the participant training program will be a factor in determining the capacity and ability of each local community to provide, manage,operate, and maintain facilities to required standards; and through capacity gained in training, serve as competent contractors able to provide assistance in the restoration and preservation of local resources and cultural sites.

Objective #1: Develop Accredited Local Resident Training & Site StewardshipCurriculum

Objective #2: Develop and Secure Training and Site Stewardship Partnerships

Objective #3: Conduct Recruitment, Trainee Selection, Placement and Support

Objective #4: Coordinate Workshops, Field and Classroom Training, and Internships

Objective #5: Evaluation, Training Certification, and Advancement to Higher Education

By way of example, the approach for utilizing existing regional community service training programs will assure that local communities and residents receive the necessary full complement of project associated training and career development counseling; e.g. the approach will also assure a cost effective delivery of trainee living and child care allowance assistance, supplemented by internship placement with Chugach village and regional corporations, regional service organizations, participating federal and state resource management agencies, and appropriate on-going restoration, research and scientific projects.

D. Completion Date

By October 1, 1996, the first year training assessment and curriculum development objectives will be completed, and the first year cadre of trainees will have completed their first six months of course schedule. Training service providers and trainees will have completed an indepth review and evaluation, and recommended any necessary training modification. Trainees will have determined their ability and desire to continue with training and selection for internship placement scheduled for the 2nd year of each trainees schedule, and more extensive 3rd and 4th year training through vocational or higher education enrollment.

By October, 1999, four project training cycles will have been completed, with minimally 14 to 21 local residents receiving occupational exposure, training and advancement to higher education and career opportunities; and the project's evaluated and refined training curriculum components will integrated with existing regional community service training, educational, and career development programs.

COMMUNITY INVOLVEMENT

The region-wide approach to this project was initiated and developed over the course of the last five months (December, 1994 to March, 1995) through the facilitated involvement of delegated representatives from each of the communities within the oil spill impacted Chugach region. Community delegates have attended three major planning workshops and conferences on the development of consortium approach. The workshop and conference delegates evolved the general consensus that there were areas of need which are common to each community; that these needs could best be met by a project carried out through a region-wide cooperative effort; and that the benefiting results should be the cost effective / efficient delivery and accomplishment of training and internship for local residents. The Native Village of Eyak Tribal Council drafted the original project proposal, and it was revised through comment from the other communities and professional sources.

The delegates from the communities of the oil spill impacted Chugach region have been and will continue to be involved from inception to completion in all aspects of: the development of training course curriculum career opportunity exposure; recruitment and selection of local trainee candidates; monitoring and evaluation of the project and trainee progress; and future selection and placement of trainees who have successfully completed scheduled training courses, intern assignments, and/or vocational higher education or professional degree studies.

The Chugach regions' existing training, internship, and scholarship Board of Trustees, and program committees, will be utilized to provide project oversight, monitoring, and advisory review. The committee includes delegated representatives from each community, and will be supplemented with professional advisors from the University of Alaska, the Alaska Job Corps Training Center, and other participating lead agencies.

The project effort will facilitate the involvement of e.g., the local and regional education area district schools, University, Job Corps Center, and cognizant federal and state agencies, in presenting program awareness materials, and course/career opportunity exposure workshops or seminars at the local level.

With the completion of each part of their course schedule, upon return to their local communities, local trainees will be asked to share their newly acquired knowledge and skills, and participate in workshops and policy conferences on site stewardship and local resource co-management.

FY 96 BUDGET

Personnel	**$50,000**	trainee "living allowance" stipends . 25 FTE regional archaeologist / training coordinator
Travel	**$70,000**	travel archaeological field sites and training centers: Kodiak Prince William Sound, Cook Inlet, Anchorage, Fairbanks
Contractual	**$ 18,000**	accredited training tuition fund -regional field offices: Eyak, Chenega, Port Graham and archaeological site fee costs
Commodities	**$ 7,000**	trainee gear and books
Equipment	**$ 5,000**	trainee field equipment
Other	**$ 5,000**	trainee "child care" allowance
Subtotal	**$175,000**	
Indirect Costs @9%	**$ 15,300**	project administration & accounting / agency flow-thru rate
EVOS Total	**$190,300**	
Estimated Yrly In-Kind 25% Direct Contribution	$ 4,500	project office space, phones, faxes, equipment, etc.
Estimated Yrly In-Kind Value Service Contribution	$45,000	accredited training site institutions. professional services
Estimated Existing Training Resource Match Value	$150,000	internship placement and advanced course tuition
Grand Total	**$389,800**	

PROJECT DESIGN

Design Goal:

Design, carryout and accomplish objectives of a four year seed project to develop an accredited training program for local residents in fields associated with museums, artifact repositories, archaeology, site stewardship and resource co-mangement; providing for trainee internship placement and career development counseling for 14 - 21 residents from the Chugach region's oil spill impacted communities; and provide for the integration of the developed components and curriculum within existing region-wide training and career development program structures.

The proposed project and training design is to assure local community involvement, management, and operation of cultural centers, artifact repositories, and subsistence restoration facilities; which meet the requirements found under federal Title 36 Part 79. The oil spill has created a necessity for local residents and their communities to become knowledgeable of non-traditional skills, i.e. research and survey methods, scientific techniques, and repository management. The project recognizes that the oil spill dislocated local residents and whole communities from their traditional occupations and subsistence economies.

The project phases and objectives will be designed to ameliorate the oil spill's dislocation of economies and occupational impact; support community management and facility capacity building; assure provision and support for individual efforts to receive adequate training and opportunity for career development, and assist trainees in securing gainful local employment in the new fields of occupational opportunity - created in part by the oil spill. Key phases and objective components of the project include:

A. Objectives

Objective #1: Develop Accredited Local Resident Training & Site StewardshipCurriculum
By December, 1995, the curriculum objectives of the training program will be developed and detailed in consultation with the local communities, EVOS Restoration Office, the University of Alaska Rural Programs Department, the National Park Service, Forestry Service, Fish & Wildlife, the Alaska Job Corps Center, the Chugachmiut (JOM, Indian Education, JTPA) Community Training and Education Program, and other appropriate agencies or institutions with expertise. The developed, reviewed and approved curriculum will be submitted for appropriate vocational and/or higher education course accreditation.

Objective #2: Develop and Secure Training & Site Stewardship Development Partnerships
By February, 1996, in tandem with objective #1, conduct region-wide community planning sessions that will address tasks for identifying funding sources, building partnerships with regional and local agencies, training and internship site identification; finalize project partnership memorandums of understanding with participating university programs, federal and state agencies, museums, vocational training centers, foundations, and the private-sector for commitments too: (a) provide supplemental project resource or funding support, (b) sponsor, or assist with, on-site training and trainee "sampling" internship placement opportunities; and (c) provide for inclusion in vocational school or university classroom training.

Objective #3: Conduct Local Recruitment, Trainee Selection, Placement & Support
By April 1996, the consortium would facilitate local community recruitment, trainee selection, training placement, and assure provision of budgeted support. Each community council will make final selection of their local candidates for training. A tailored course schedule will be developed for each trainee. 14 - 21 trainees will have the opportunity to select between introductory workshops and part-time or full-time field and/or classroom training courses which best meet their schedule; and which will assist them, at each stage, in determining how far they wish to take their training and career path opportunity.

A. Objectives

Objective #4: Coordinate Workshops, Field and Classroom Training, and Internships
By May, 1996, begin first year pre-training orientation sessions and introductory workshops. Followed by June, 1996, startup of the project's 1st (1 of 3) Year: Summer Internship & Field Training (SIFT) Course, with participants beginning a 3 to 9 month course of field and classroom curriculum instruction internship and career field development exposure.

Objective #5: Evaluation, Training Certification, and Advancement to Higher Education
By October, of each project fiscal year, training participants and training program curriculum will be evaluated, accredited training certification issued, and participant advancement to higher education recommended. Policy standards for this component will be developed under Objective #1.

B. Methods

The overall project and training effort will be under the coordination and supervision of a qualified resident archaeologist / curator - selected by the Chugach OSIR Communities Consortium, with experience at sites within the region. The project's regional (archaeologist) coordinator will be responsible for final preparation of the training course and internship placement plan, and securing training site and classroom agreements with the participating educational providers. The regional coordinator will assure that generally accepted standards and methods are employed in the design and conduct of the proposed training and career development project. Career field professionals, educational institutions, state / federal agencies, and the EVOS Restoration Office will be utilized to assist with preparation of a full training and career development curriculum, which will complement restoration efforts.

Chugach regional service organizations, village and regional corporations, are expected to provide a variety of support services to assure proper project and grant administration, accounting, delivery of technical assistance, and field site training and internship opportunities. Chugachmiut will provide community service e.g., - job training and educational counseling, assisting local communities with recruitment of training candidates, assisting trainees with their career awareness and development, and transition from training to higher education opportunities. Services to be provided meet both federal and state program standards, are audited and evaluated annually, and are coordinated closely with local, state, and outside educational institutions. Chugach Heritage Foundation will provide trainee scholarship support and assist in securing supplemental funding for the immediate project effort and development of long-term program funding. CHF will also assist with, e.g., project progress reports and publications, workshops, and advisory / review meetings.

C. Contracts and Other Agency Assistance

There is no anticipated need for contracting with the private-sector, by which a private-sector entity would receive project funds. Associated private-sector entities within the region and local communities, e.g. village and regional profit corporations, will be asked to provide internship and field site training opportunities. This is expected to take place through project partnership memorandums of understanding.

It is expected that the project will make extensive use of governmental agencies - universities. However, it is expected that acquired agency program and institutional services to be provided will be those that are already generally provided and available upon formal request. It is expected that the project will provide for trainee tuition and child care costs, and these are expected to be provided for under some form of contract / scholarship support agreement with selected providers and educational institutions.

Standard travel and accommodations contracting will occur with airlines, hotels, or landlords. This contracting will take place consistent with federal OMB standards and Chugachmiut accounting policy guidelines.

D. Location

The project's field training components will be undertaken within the oil spill impacted Chugach region, at sites generally close to the trainee's local community. The local communities are: Chenega, Tatitlek, Eyak / Cordova, Valdez, Port Graham, Nanwalek, Quteckak/Seward. It is expected that a primary regional site for the archaeological field training will be on Nuchek Island, at the ancestral village site of Nuciiq. Trainees will also travel to Kodiak for field and museum / curation training at the Kodiak Alutiiq Archaeological Repository Center. It is anticipated that travel to museum and university facilities in Anchorage and Fairbanks will be scheduled.

The project's administrative offices and the regional archaeologist / training coordinator will be located in Anchorage, and serve as the liaison point between the communities and Anchorage based institutions and agencies. Eyak / Cordova will serve as the regional archaeologist's summer field office for archaeologial sites and training in the southeastern part of Prince William Sound. Chenega Bay will serve as the field office for sites and training in the western part of Prince William Sound, and Port Graham will serve as the field office for the Lower Cook Inlet area.

Project Benefits:

The project will provide for 14 to 21 participants from Chugach region oil spill impacted Villages and Alaska Native communities to be recruited and selected for tailored occupational training in the fields of archaeology, curation, and site stewardship and resource co-management. The training curriculum sections will, in many cases, augment existing local skills, educational knowledge, and experience. A key objective of training is to: enable local communi-ties and residents to develop, operate and maintain local community museums, repositories, cultural centers, restoration facilities; and be responsible for site stewardship and resource co-management.

The project participants will be exposed and trained in a variety of related skills and specialization areas. After completion of training under this project, the introductory exposure and training will allow participants and their communities to determine the desire and need for extended training and/or enrollment in higher education degree programs. Upon completion of the project, the project's developed, demonstrated, and evaluated training curriculum will be integrated with and become components of the existing local and regional training and career development service structures and programs. Each community, and local residents, within the oil spill impacted Chugach region will benefit from the provision of training and career development opportunities for at least 2 local residents from each community. Each year, it is expected that participants will complete 480 to 1900 hours of training and internship.

Each community will benefit from the presence of successfully trained residents and as a result acquire a community capacity for the management and operation of cultural centers, artifact repositories, subsistence restoration and co-management facilities. The project schedule is designed to provide for the completion of training, for the first class of participants, by the construction completion and occupancy dates for local community facilities.

The Restoration effort is served and enhanced with the involvement of trained local residents, and with the support of agencies, researchers and scientists to assure the trainee quality internship and career development opportunities - the results of the restoration effort will be preserved through qualified local resident site stewards and resource co-managers.

The project's region-wide approach to meet the common community -need for local resident training will provide overall cost effectiveness and efficiency benefits. The approach will meld existing regional training and career development service programs - with the immediate needs of the project and facilitate the institutionalization of a permanent training program focused on the project's area of endeavor.

SCHEDULE

A. Measurable Project Tasks for FY 96

The following Project Tasks calendar schedule represents the general cycle of training for each of the project years FY - 96 to FY -98. The field training durations and classroom sessions, and level of education, will be extended as participants advance and enter their second, third, and fourth years.

June - Dec., 1995:	Objective #1:	Develop Accredited Local Resident Training & Site Stewardship, Co-Management Curriculum
June - Feb., 1996:	Objective #2:	Develop and Secure Training and Internship Placement Partnership Support Agreements
Nov. - Mar., 1996:	Objective #3:	Conduct Local Recruitment, Trainee Selection, Placement & Provision of Support
April - Sept., 1996:	Objective #4:	Coordinate / Conduct Workshops, Field and Classroom Training, and Internship Placement
Sept. - Oct., 1996:	Objective #5:	Evaluation, Training Certification, and Advancement to Higher Education

B. Project Milestones and Endpoints

05-01-95:	Submission of Project Application to EVOS Trustee Council
06-01-95:	Organization of Training Curriculum Development team
06-15-95:	Develop Training Agreements and Internship Placement Partnerships
10-01-95:	First Draft of Training Curriculum Plan
11-01-95:	Submission of Training Curriculum Plan for accreditation / continuing education
11-01-95:	Begin recruiting Local Resident Trainee Candidates
12-15-95:	Accreditation and EVOS approval of Training Curriculum Plan
02-15-96:	Finalize Training Agreements and Internship Placement Partnerships
03-15-96:	Select Local Resident Trainees and complete Participant Training Agreements
04-02-96:	Conduct Pre-Training Orientation and Introductory Workshops
04-05-96:	Complete Trainee schedules, placements, introduction; and provide training gear, equipment, and books;
04-15-96:	Begin first year of project's Summer Internship and Training Program
09-12-96:	Complete first year Summer Internships and Training courses
09-15-96:	Candidates for advanced training identified
Jan., 1997:	Advanced field training and schooling begins; new trainees recruited
June, 1998:	Advanced field training completed, candidates for higher education identified
Oct., 1999:	Project completed; training project institutionalized within existing regional community training and career development service programs

C. Project Reports

Quarterly project reports will be provided to the consortium communities, and "annual" reports that describe progress made toward each objective during the year and that include preliminary analysis of completed segments of the project will be completed.
Monthly project accounting reports will be prepared and submitted.
Trainee Progress Reports will be completed at the end of each training session / component.
Training Certification Reports will be prepared upon completion of training.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

The coordinated effort will involve each of the Chugach regional organizations currently providing services to the consortium communities. Project development and training will be coordinated with the Kodiak Alutiiq Archaeological Repository Center, the Smithsonian Arctic Studies Center, the University of Alaska, the National Park Service, the U.S. Forest Service, the Alaska Native Human Resource Development Program, the Alaska Job Corps Training Center, the Chugach Alaska Corporation, and Village Corporations.

The project will seek integration with other restoration projects through the placement of trainee / interns with researchers and scientists operating and conducting studies within the Chugach region. Similar intern placement will be sought with the Alaska Department of Fish and Game, Department of Natural Resources, and the U.S. Department of Interior Fish and Wildlife Service. Key lead agencies would participate as ex-officio members of the project's community advisory committee. Matching funding has been, or will be, secured from other non-Trustee Council sources. Regional ANCSA non-profit and profit corporations will be key contributors of matching and in-kind resources.

ENVIRONMENTAL COMPLIANCE

The training project will not require any environmental analysis or NEPA documentation. However, as a part of the training curriculum, participants will become familiar with applicable environmental regulations and NEPA.

PERSONNEL

The project will be under the direction of a regional (archaeologist) coordinator with a educational degree in archaeology and/or curation, and a background of experience working as an archaeologist within the Chugach region and general oil spill impacted area.

In support of the project, each participating regional organization will provide the services of professional staff in the areas of program / project administration, planning, accounting, travel scheduling, and client / trainee counseling and career guidance.

Project lead personnel and professional advisors are expected to include:

Dr. Lora L. Johnson, Archaeologist - Chugach Region
Dr. Arron Crowell, Smithsonian Arctic Studies Center
Rick Knecht, Kodiak Alutiiq Archaeological Repository
Don Callaway, U.S. DOI, National Park Service
John Johnson, Chugach Alaska Corporation - Cultural Resources Manager
Joyce Wemark-Birdinground, Chugachmiut Community Services Coodinator
Cheryl Sampson, Chugachmiut Director of Planning and Administrative Services

Project Title: **Community Museum, Repository, Archaeological, Site Stewardship, Co-Management Training & Human Resource Development Project**

Dr. Lora L. Johnson
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e-mail address / will be available August, 1995.

Don Callaway
National Park Service
3303 "C" Street
Anchorage, Alaska
Phone number Fax number
e-mail address/

Prepared this 29 th day of April, 1995

Submitted under authorization and on behalf of the participating Chugach region oil spill impacted communities.

James Sinnett
Chugach Heritage Foundation
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Phone Number: (907) 561-3143
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e-mail address / will be available August, 1995.

96153

LETTER OF TRANSMITTAL

To: **Exxon Valdez Oil Spill Trustees Council**
EVOS Restoration Office

From: **Jim Sinnett, Program Planner**
Chugach Heritage Foundation

Date: **May 1, 1995**

Re: **Final draft submission of EVOS FY-96 Project Application**

Project Title: **Community Cultural Centers, Repositories and Subsistence Restoration Facilities - Comprehensive Design, Engineering, Financing, and Construction Development Project**

Restoration Category: General Restoration

Proposer: **Chugach OSIR Communities Consortium:** A Consortium of the Oil Spill Impacted Region (OSIR) Villages and Alaska Native Communities of Chenega, Tatitlek, Port Graham, Nanwalek, Eyak, Seward, and Valdez

Project Originators: **Chenega Bay IRA Council**
Chenega Village Corporation
Tatilek IRA Council

The following Project Application is submitted under authorization and on behalf of the participating Chugach region oil spill impacted communities. The project purposes were arrived at through discussion and consensus of the participating communities. It is expected that the project details will continue to be refined through the EVOS review process and EVOS negotiations with the participating communities. Chugach region communities, not having already done so, are to provide project application submission authorization letters by May 29, 1995. Final Resolutions of participation will be considered for adoption after review of the project as finally negotiated with the EVOS Trustees Council.

The Kodiak Alutiiq Archaeological Repository Center and the Chenega Bay Artifact Repository are to be presented, reviewed, and considered as model multi-use facility designs, and demonstrated approaches for securing financing and partnership involvement. Chenega Bay facility concept designs are attached as an addendum to the project application.

A detailed line-item project and "place hold" budget, prepared on the "Excell" software program, will be submitted after initial review is completed by the EVOS Restoration Office

Project Title:	**Community Cultural Centers, Repositories and Subsistence Restoration Facilities - Comprehensive Design, Engineering, Financing, and Construction Development Project**	
Project Number:	96153	
Restoration Category:	General Restoration	
Proposer:	**Chugach OSIR Communities Consortium:** A Consortium of the Oil Spill Impacted Region (OSIR) Villages and Alaska Native Communities of Chenega, Tatitlek, Port Graham, Nanwalek, Eyak, Seward, and Valdez	
Project Originator:	**The Chenega Bay Village Corporation**	
Lead Trustee Agency:	Alaska Department of Environmental Conservation	
Cooperating Agency:	US Forest Service and National Park Service	
Regional Lead Agency:	North Pacific Rim Regional Housing Authority	
Regional Assistance:	Chugachmiut, Chugach Regional Resource Commission, Chugach Heritage Foundation, Chugach Alaska Corp., Chugach Development Corp., et. al.	
Duration:	Multiple years:	Three (3) fiscal years, FY 1996 to FY 1998
Cost FY 96:	$2,588,282	Site Surveys, Visits, Concept & Preliminary Designs Bidding Services, Administration Services; 1st Year Off-site utilities and Building Construction of Regional Field Repository Facilities
Cost FY 97:	$2,588,850	Off-site utilities and Building Construction of Local Satellite -Cultural Centers, Subsistence - and Restoration Support Facilities
Cost FY 98:	$3,622,868	Off-site utilities and Building Construction of Regional Museum Repository Facilities
Total Place Hold Amount:	**$8,800,000**	
Geographic Area:	Chugach Region Oil Spill Area: a Service Delivery Area inclusive to all unincorporated and Alaska Native subsistence communities within the Chugach oil spill impacted region.	
Injured Resource/Service:	All Injured Archaeological, Subsistence, Cultural Resources / Services	

ABSTRACT

The **Chugach OSIR - Community Cultural Centers, Repositories, and Subsistence Restoration Facilities - Comprehensive Design, Engineering, Financing, and Construction Development Project** purposes are to provide a consolidated, coordinated and cost effective/ efficient approach to the progressive development, financing, and construction of local community and region-wide service facilities. Completed construction of such facilities, scaled to the local needs and capacity of each community, is considered fundamental to achieving and maintaining the region-wide long-term restoration of injured resources, subsistence services, and assuring provision for local and regional repository and site stewardship services. Facilities are essential and a prerequisite too: repatriation of artifacts removed from their local historical sites, preservation of the Chugach region's cultural heritage; restoration of traditional occupations and local subsistence economies; and is the ultimate provision required in community capacity building for acquisition and use of new skills and knowledge, to sustain the accomplishments of the restoration effort.

INTRODUCTION

In the interest of restoring and preserving Alaska's heritage, the *Exxon Valdez* Oil Spill Trustee Council has expressed formal statements of dedication to the restoration and preservation of injured cultural resources and traditional Native culture. To accomplish this element of the restoration and preservation effort requires a commitment to the provision of supporting facilities. In keeping with these purposes, the Trustee Council approved the Kodiak Alutiiq Archaeological Repository Center, serving the Kodiak region oil spill impacted area, as the pilot cultural facility project. The Kodiak and Chenega Bay project facilities will serve as models for the development of community facilities within the Chugach region.

The restoration effort being proposed is for the development and provision of cultural centers, repositories and subsistence restoration facilities, scaled to the needs and economies of each local community within the Chugach region oil spill impacted area; which will serve to house the long-term restoration and site preservation services. The proposed project effort would be carried out through a collaborative and coordinated effort of the local communities and their regional service organizations, in partnership with their local and regional ANCSA corporations, government agencies, and financial institutions.

The Chugach region Villages and Alaska Native communities of the Lower Cook Inlet and Prince William Sound, impacted by the oil spill, each have documented the need for a cultural preservation center, repository, and/or subsistence restoration support facility. The communities have also examined their overall facility needs to determine multi-use possibilities. The facilities in each local community will be a focal point for archaeological research and surveys, repositories for excavated /repatriated artifacts, archives for local and regional maps and resource data, and provide field site offices and labs for federal and state agencies and EVSO scientific projects. Each facility will serve and assist in the restoration of subsistence resources and preservation of traditional subsistence practices of the local Alaska Native community. A recent survey indicates the scale, the size, the functional purpose of need facilities differs in each local Village and Alaska Native community. And, generally, each community is at a different stage in their facility - planning, design, engineering, financing, and readiness for construction - process.

Within the Chugach region, **(a)** two village communities, Chenega and Tatitlek, are prepared for preliminary planning, design / engineering phases for their proposed repository or subsistence support facilities; and are prepared to immediately proceed with financing development, preliminary and final engineering, site preparation and construction in FY 96, when financing commitments are secured; **(b)** Port Graham, Nanwalek and Eyak / Cordova have conceptual plans and initial designs; are ready to carry out preliminary planning, design and engineering in FY 96, and construction in FY97; **(c)** the Alaska Native communities of Seward and Valdez will prepare conceptual plans and initial designs in FY 96, preliminary plans, design / engineering in FY 97, and construction in FY 98. 14,000 to 21,000 square feet is the current region-wide estimate of needed space for local cultural centers, repositories, and restoration facilities.

This region-wide comprehensive and coordinate project effort will provide for a multiple-use design approach for the development and construction of cultural centers and subsistence restoration facilities in each of the Chugach regions' local villages and Alaska Native communities impacted by the oil spill. The facilities are to serve and be scaled too the local, sub-regional, and region-wide restoration needs and the unique functional service and use possibilities of each community.

The project goal and effort is to facilitate, coordinate and provide for the various professional and technical service elements essential to achieving the cost effective and efficient design, engineering and construction of local community cultural centers and subsistence restoration facilities. Common project objective elements and costs categories include, but are not limited to: (1) Topographic surveys; (2) Soil surveys; (3) Site survey design and engineering visits; (4) Preliminary designs; (5) Bidding services; (6) Administration services; (7) Installation of off-site/on-site utilities; and (8) Building construction.

NEED FOR THE PROJECT

A. Statement of Problem:

Lack of facilities to house recovered artifacts has resulted in the transport of artifacts to institutional locations outside the region and local communities. Repatriation of local artifacts is dependent upon local facilities designed and constructed to meet required repository / curation standards. Future site stewardship and curation, managed at the local community level, is dependent upon the provision of facilities which meet these certain required standards. Without facilities, artifacts cannot be returned to the locales from which they were removed.

Archaeological: Archaeological resources were injured by the oil spill. Sites and artifacts were oiled which interferes with study of the artifacts and radiocarbon dating to determine age. Looting and vandalism increased at sites because of increased opportunity as a result of the cleanup and increased knowledge of site locations.

Unlike many of the resources which were injured by the oil spill and associated cleanup activities, archaeological sites are non-renewable. They are the only records we have of the history of the prehistoric indigenous people of the spill area, records that when systematically excavated, can be interpreted by an archaeologist. Injury to an archaeological site; removal of soil cover by trampling, holes left by looters; is comparable to injury to a library building. When the roof is torn away, and the windows broken, the entire contents are gradually lost. The Exxon Valdez Trustee Council has funded projects to restore some injured sites by replacing the disturbed cover on sites and through erosion control, but some sites can only be restored through excavation of the sites and recovery of the artifacts. The Chugach Alaska Corporation has, in association with Village Councils, Village Corporations and regional service organizations, sponsored archaeological excavations in an effort to rescue threatened sites and artifacts.

Lack of facilities to house field research work precludes and limits the full and meaningful involvement of local residents in current subsistence restoration efforts, or future local resource co-management opportunities; lack of facilities precludes local, enhancement, maintenance and preservation of the end-of restoration accomplishments; lack of facilities constrains community capacity building, and limits local ability to receive the benefits of training and internship placement with researchers and scientists; and limits first-hand opportunities for use and interactions between traditional knowledge and the research and scientific knowledge of the local and regional area, acquired through restoration efforts.

Subsistence: The Exxon Valdez oil spill caused severe disruption of the lives of many people living in the spill impact area, dislocating them from their traditional local occupations and economies. The spill also caused residents of the area to be concerned about the safety of their wild food sources, and the integrity of the surrounding natural environment . While scientific studies aimed at restoring the resources and services damaged by the oil spill have occurred throughout the spill area, most of the researchers work for agencies or institutions based in Anchorage, Fairbanks, or outside Alaska. Residents have complained of a lack of involvement by spill area communities in the restoration efforts, and incomplete communication to spill area inhabitants of study proposals and results.

At the same time, researchers have recognized that local residents have traditional knowledge that could help them answer questions they have not been able to answer through conventional scientific means. However, researchers do not have ready access to knowledgeable local residents. People living in the spill area have detailed knowledge about the condition of resources, which can significantly add to data collected as part of scientific studies, and possibly even enhance the success of restoration efforts. Local people have expressed a desire to be involved in all aspects of restoration projects, and a willingness to work with researchers. Facilities provide a physical community location where these desires can be fulfilled.

B. Rationale

As stated in the Draft 1994 EVOS Report - Spill Area Site and Collection Plan, Report to the Exxon Valdez Oil Spill Trustee Council by Judith Bittner and Douglas R. Reger, the EVOS settlement between the Exxon Corporations, the Federal government, and the State of Alaska specifically identified damaged archaeological sites and artifacts from those sites to be restored and protected. By funding the repository in Kodiak, the Council members recognized the need to support long term curation for archaeological collections in in the spill area and also recognized the desirability of keeping collections near their origin.

Along with the current report of Doug Reger, recommending consideration of a regional and satellite facility approach, the Council's own draft report recommends the creation or expansion of regional repositories in the Prince William Sound and Cook Inlet regions. Provision of these facilities, on going site stewardship, and careful coordination among the region's participating communities, corporations, as well as, with the Kodiak Museum and Cultural Center, the Smithsonian Arctic Studies Center, etc., will serve as extraordinary evidence of the Chugach region's commitment to work with the Trustee Council to ameliorate the long term cultural damages of the Exxon Valdez oil spill.

In addition, there is considerable momentum in the region's communities to expand the repository goals beyond curation, exhibit facilities, and archives to include remediation of damages to subsistence through cultural heritage preservation, and provision of field site research and stewardship facilities. Under the multiple use design approach, programs such as traditional and scientific based subsistence training can be more cost effectively housed in multiple-use facilities, along with, e.g. language preservation and arts and craft, programs which are related to or require the traditional use of subsistence resources.

Each community has a demonstrated need for restoration related facilities, which when completed will assure long-term facility capacity for locally operated and managed cultural and natural resource / habitat programs, as well as, e.g. housing for forestry or park service, or environmental disaster response offices. Coordinating the design to funding of cultural centers and/or subsistence restoration facilities in each local community is a process which will require 12 to 18 months, depending on the stage each community is at. Overall, the proposed region-wide comprehensive and coordinated approach should result in significant cost savings in the identification, design, engineering and ultimate construction of local facilities.

The scaled facilities for each community, approved by the EVOS Trustee Council, should be designed primarily to provide adequate space respositories for the safe, secure storage and/or display of repatriated and/or locally recovered artifacts. The scaled facilities will also assist and in great part assure the involvement of oil spill area communities and local residents in the ongoing subsistence and resource restoration efforts of the Trustee Council. Such facilities will provide field office sites for research scientists, archaeologists and other investigators working in the local community area. The provision of such facilities will improve the collaboration, coordination and communication with the local community and knowledgeable local residents.

EVOS Trustee Council Place Hold Commitment Is Essential to Facility Financing Development: A place hold on the requested estimated amount of $8,800,000 is essential to further financing development and commitment of funding from other sources, e.g. granting agencies (HUD / CDBG, State RDA,) and funding institutions (National Cooperative Bank, Indian Loan Development Banks, Rural Development Initiative Funds, AEIDA), and facility ownership partners (Village Corporations) and prospective facility tenants (i.e. National Park Service, Forestry Service, and restoration research and scientific project teams). Having a "place hold" on a known amount of commitment from the EVOS Trustee Council will facilitate the financing development effort. The approach proposed also assures that each community completes the requirements associated with each phase, before receiving further EVOS funding and proceeding to the next phase.

C. Summary of Major Hypothesis and Objectives

Given that the Exxon Valdez Trustee Council has expressed dedication, and that each Chugach region oil impacted Village and Alaska Native community has a desire and demonstrated local need, a region-wide consolidated, comprehensive and coordinated approach to the development of local community cultural center and subsistence restoration facilities is the most cost effective and efficient approach and should result in significant overall costs savings.

The approach is designed to fully utilize the Chugach region's existing non-profit service organizations, technical assistance, professional talents and community-based service expertise, and similarly facilitate the partnership participation of the Chugach Village and Regional ANCSA (profit) Corporations; educational and financial lending / bonding institutions; federal and state agencies; private industry and business; and other source Foundations. It is anticipated that affiliation with the NPR Housing Authority will allow for a "turn-key" design and local "force account" construction approach. Significant cost savings are expected and unexpended allocated / "place hold" funds would be placed in a region-wide Community Facilities O & M (operations and maintenance) (sinking) Reserve Fund.

The end result and objectives go beyond simple funding support and provision for facilities in each local community impacted by the oil spill. Facilities are essential to acheiving community capacity building objectives. The constructed facilities will serve as the necessary housing for "localization" of restoration / preservation projects; will assure the ability to institutionalize, at the local level, traditional use knowledge and research knowledge acquired through the restroration effort; and will support the long-term requirements for local site stewardship and oil spill response capacity.

The consolidated region-wide approach to determination of multiple use opportunities (e.g. inclusion of space for health clinics, public safety offices, forestry and park service field offices, village / tribal operation offices, village corporation offices, contracted field offices for restoration projects and site stewardship, etc.) will be a key subvention element and necessary to securing participating and match funding for the local facilities.

Primary Objectives:

Objective #1: Complete a Comprehensive region-wide Community Needs Assessment and Conceptual Design Study of local Cultural Centers, Artifact Repositories, and Restoration Facilities

Objective #2: Complete Topographic Surveys, Soil Analysises, A&E Site Visits, and Preliminary Designs for local Cultural Centers, Artifact Repositories, and Restoration Facilities

Objective #3: Complete Preliminary Design, Environmental, and Project Financing reviews and secure EVOS Trustee Council authorization to proceed with Construction Documents and Bidding Services

Objective #4: Secure supplemental / participating funding and financing for approved design facilities; match EVOS funds with RDA and CDBG grant funds

Objective #5: Complete Off-Site Utilities Installation and Building Construction of local Cultural Centers, Artifact Repositories, and Subsistence Restoration Facilities

Objective #6: Occupy facilities and accomplish localization of Restoration Projects and implement Museum, Archaeological, Artifact Repository, Subsistence and Cultural Programs

D. Completion Date

The project is to be carried out over a multi-year period, from FY 96 to FY 98. Completion dates will vary from community to community. Preliminary design, engineering, and financing requirements will be completed, for all participating communities, by the end of FY 97. With Trustee approval, construction of the first local facilities is expected to be completed by FY 96. With Trustee Council approval of the projects' progressive development phases, it is expected that local facility construction will be completed in all participating communities by FY 98.

Projected Calendar Year Completion Schedule:	**Phase I Concept Design**	**Phase II Preliminary Design A&E**	**Phase III Financing Bidding**	**Phase IV Util/Building Construction**	**Phase V Inspection Occupancy**
Community:					
Chenega Bay	95	96	96	96	97
Tatitlek	95	96	96	96	97
Port Graham	96	96	96	97	98
Nanwalek	96	96	96	97	98
Eyak / Cordova	96	96	96	97	98
Seward	96	96	96	97	98
Valdez	96	96	96	97	98

COMMUNITY INVOLVEMENT

The general consensus of the communities is that one means of improving the involvement of the oil spill impacted communities in restoration activities is to assure provision of facilities to house local cultural and resource / subsistence restoration activities. Over the course of the last year, each community has been involved in a variety of agency surveys and local meetings to determine their respective needs for cultural centers and restoration facilities. Community leaders and residents will continue to be actively involved from inception to completion in determining the need, scale, functional purposes, design, subvention and construction of their local facilities.

A Chugach Region Cultural Centers, Repositories and Subsistence Restoration Facilities planning and development committee shall be established for the purposes of this project. Each community will designate a resident member to serve on the committee. The committee will work with project staff and consultants, review plans for duplications and gaps; exchange information relevant to development, subvention and other assistance; and consider ways for the harmonious blending of various disparate program or service activities for greater effectiveness and economy where such authority exists; and recommend facility plan changes where such need is determined.

The involvement in facility planning and development will be supplemented with the advisory review services of, but not limited to, the Chugach Region Elders; Chugach Village and Regional ANCSA Corporations; the North Pacific Rim Housing Authority; the Kodiak Alutiiq Museum and Cultural Center; and the Smithsonian Arctic Studies Center. The project will also involve other Chugach region service programs; e.g. health clinic and public safety; village council / tribal operations; village power and water utilities; to determine multiple use and match / funding opportunities.

FY 1996 BUDGET: **Chugach Region Consolidated Community Projects Budget**

For the Design, Engineering and Construction of Community Cultural Centers, Artifact Repositories, and Subsistence Restoration Facilities (estimates based upon the Kodiak and Chenega Bay Conceptual Design Study models)

	Total Budget Proposed	Per Site Cost Estimate	No. Local Sites
Personnel			
Project Coordinator	58,000	-0	NPRHA
Project Assistant	32,000	-0	NPRHA
Travel			
Sites Visit	21,000	4,800	7 sites
Architect			
Electrical Engineer			
Civil Engineer			
Contractual			
Conceptual Design Study	100,000	20,000	5 sites /3 - /7
Topographic Survey	15,000	7,500	/1 & /2
Soil Analysis	12,000	6,000	/1 & /2
Preliminary Design	50,000	25,000	/1 & /2
Construction Documents	120,000	60,000	/1 & /2
Architectural			
Civil			
Structural			
Mechanical			
Electrical			
Bidding Services	12,000	6,000	/1 & /2
Construction Administration	60,000	30,000	/1 & /2
Reimburseables	40,000	20,000	/1 & /2
FY 96 Release Funding: **Subtotal:**	**520,000**		
Commodities			
Off-site Utilities			
water/sewer/electrical	50,000	25,000	/1 & /2
telephone			
Building Construction			
Chenega Bay	1,388,282	5,000 sq ft	/1 artifact repository
Tatitlek	416,000	1,500 sq ft	/2 subsistence facility
Equipment	0		**Local Site Key**
Subtotal	**2,374,282**		/1 Chenega
			/2 Tatitlek
Gen. Admin.			/3 Eyak Cordova
Indirect @ 9%	214,000		/4 Port Graham
			/5 Valdez
FY-96 Place Hold **Total:**	**2,588,282**		/6 Seward
			/7 Nanwalek

PROJECT DESIGN

A. Objectives

Objective #1: Complete a Comprehensive region-wide Community Needs Assessment and Conceptual Design Study of local Cultural Centers, Artifact Repositories, and Restoration Facilities

Objective #2: Complete Topographic Surveys, Soil Analysises, A&E Site Visits, and Preliminary Designs for local Cultural Centers, Artifact Repositories, and Restoration Facilities

Objective #3: Complete Preliminary Design, Environmental, and Project Financing reviews and secure Trustee Council authorization to proceed with Construction Documents /Bidding Services

Objective #4: Secure supplemental / participating funding and financing for approved design facilities; match EVOS funds with RDA and CDBG grant funds

Objective #5: Complete Off-Site Utilities Installation and Building Construction of local Cultural Centers, Artifact Repositories, and Subsistence Restoration Facilities

Objective #6: Occupy facilities and accomplish localization of Restoration Projects and implement Museum, Archaeological, Artifact Repository, Subsistence and Cultural Programs

B. Methods:

Generally accepted standards and approaches for community single site / multi-use facility design, engineering, financing, and construction will be employed. A method of region-wide project coordination will take place and assure identification of duplication and gaps in the project effort. The "turn-key" approach is expected to be key method for construction of facilities in each community. Consolidated material orders will assure bulk purchasing power and cost savings. Consensus on the use of the Kodiak and Chenega Bay model facility designs will be one method to reduce overall costs and achieve capitalization of (region-wide) Community Facilities O&M Reserve Fund.

Alternatives:

The alternative to the proposed consolidated approach is to leave the communities to their own individual effort and submission of separate EVOS project applications; which would preclude acheiving significant cost savings, and benefitting from cost effectiveness and efficiencies available through the comprehensive and coordinated region-wide approach. Individual community applications would result in areas of duplicative costs, and diminished materials purchasing power. The individual application alternative would preclude a coordinated opportunity to expose duplications or gaps in the provision of facilities for cultural center, artifact repository, subsistence, or general restoration service needs. The methods proposed, involved in the region-wide approach, will result in significant cost savings by the elimination of duplicative efforts in the design and engineering process. A consensus on design models for regional and local facilities will significantly reduce the overall cost of construction.

C. Contracts and Other Agency Assistance:

Region-wide Project Administration and Coordination: The communities consortium will contract with the North Pacific Rim Regional Housing Authority, Inc. for the provision of administration and coordination of the region-wide project. The Housing Authority will be responsible for the consolidated management effort, issuance of construction documents, and all professional bidding solicitations.

Architectual & Engineering Services: The NPR Housing Authority will secure contracted architectual, engineering, contractor services for Phase I / II: Concept and Preliminary Design, Phase III: Financing, Documents, and Bidding Services; and Phase IV Construction. Contract elements will include (1) concept designs (2) topographic surveys, (3) soil analysis, (4) A&E site visits, (5) preliminary designs, (6) construction documents, (7) bidding services. Phase IV contract elements, for construction approved by the communities and the EVOS Trustee Council, include (1) construction administration services, (2) installation of off-site utilities, and (3) building construction.

C. Contracts and Other Agency Assistance:

Facilities will be constructed under the project management of the NPR Housing Authority with general oversight provided by the State of Alaska for the Trustee Council. The capital construction procedures of the Division of Facility Construction and Operation, Alaska Department of Environmental Conservation, will be followed. It is not anticipated that the project will require contracted services from other governmental agencies. A variety of permits from state and/or federal agencies will be required.

D. Location

The region-wide project calls for the design and construction of appropriately scaled facilities in each of the Chugach region oil spill impacted communities. It is anticipated that a "regional field repository facility" will be built in one community. It is anticipated that a "regional museum and artifact repository facility" will be built in one community. It is anticipated that local area "satellite" facilities will be built in five communities. Region-wide Project coordination, administration, and accounting offices will be located in Anchorage at the NPR Housing Authority.

Project and location details for the proposed Chenega Bay Restoration Multi-Use and Repository Facilities are attached as an addendum to the this project proposal.

Project Benefits:

*Each community is provided an opportunity for a base amount of 2000 - 3000 square feet to house local community cultural centers, repositories, and subsistence and/or restoration support services.

*A place hold commitment from the EVOS Trustee Council is essential to and will facilitate development of financing for each EVOS Trustee Council approved local community facility project.

*The requested $8,800,000 funding place hold commitment will provide the EVOS Trustee Council with a one-time consolidated opportunity to settle facility provision issues and provide for the cultural center repository, and/or subsistence and restoration support facility needs identified by each community.

SCHEDULE

A. Measurable Project Tasks for FY 96

Project Tasks Calendar

Start-up to Nov. 1,	1995:	RFP / contract for A& E professional services
Dec. 15 - Mar. 1,	1996:	Phase I Community assessment and concept design for 5 communities
Dec. 15 - Mar. 15,	1996:	Region-wide Comprehensive Facilities Development Plan
Dec. 15 - Mar. 31,	1996:	Phase II - Preliminary Design for 2 communities
Mar. 31 - Apr. 15,	1996:	Preliminary Design review and approval by EVOS Trustee Council
Mar. 15 - May 1,	1996:	Submit FY 97 Phase III-Project Applications to EVOS for 2 communities
Mar. 15 - May 1,	1996:	Submit FY 97 Phase II-Project Applications to EVOS for 5 communities
May 1- June 1,	1996:	Phase III for Chenega and Tatitlek projects
June 1- Aug. 1,	1996:	Phase III bid review, evaluation and selection of construction contractor
Aug. 96- Sept. 30,	1997:	Phase IV and V: Chenega and Tatitlek projects
Oct. 96- Mar. 31,	1997:	Phase II & III: Eyak, Valdez, Seward, Port Graham, Nanwalek
Mar. 31 - Apr. 15,	1997:	Preliminary Design review and approval by EVOS Trustee Council
Apr. 15 - May 1,	1997:	Submit FY 98 Phase IV-Project Applications to EVOS for 5 communities
June 1- Sept. 30	1997:	Phase IV: Eyak, Valdez, Seward, Port Graham, Nanwalek
Oct. 30- Oct. 30,	1998:	Phase V: Eyak, Valdez, Seward, Port Graham, Nanwalek projects.

B. Project Milestones and Endpoints

07-01-95:	Secure EVOS Trustee Council approval of Project Application and secure "place hold" on total funds of not less than $8,000,000 and not more than $10,000,000; to be matched as required with other facility funding sources;
11-01-95:	NPR Housing Authority issues solicitation for Architectual / Engineering services to carry out Phase I Conceptual Design & Phase II Preliminary Design A&E;
12-15-95:	Selected A&E contractor begins concept design and preliminary design activities; conducts site visits and community meetings;
03-01-96:	Complete Community Need and Conceptual Design Studies for the five (5) Chugach region communities of Eyak/Cordova, Valdez, Seward, Port Graham, and Nanwalek;
03-15-96:	Complete a Region-wide Comprehensive Local Community Cultural Centers, Artifact Repositories and Subsistence Restoration Facilities Plan and submit to EVOS Restoration Office for review and comment;
03-31-96:	Complete topographic surveys, soil analysis, A&E site visits and Preliminary Designs for Chenega Bay and Tatitlek facilities;
04-15-96:	Submit Chenega and Tatitlek Preliminary Designs to EVOS Restoration Office for Trustee review and authorization to proceed with construction documents and bidding;
05-01-96:	Submit Community Need and Conceptual Design Studies to EVOS Restoration Office, and submit FY 97 Project Applications for topographic surveys, soil analysis, A&E site visits and Preliminary Designs for Eyak/Cordova, Valdez, Seward, Port Graham, and Nanwalek facilities.
06-01-96:	Issue solicitation request for bid proposals for off-site utilities and building construction for Chenega Bay and Tatitlek facility projects;
08-15-96:	Review and select bid proposals for Chenega Bay and Tatitlek facility projects, and submit to EVOS Restoration Office for Trustee review and authorization to proceed with off-site / on-site utilities, site preparation, and building construction
03-15-97:	Complete topographic surveys, soil analysis, A&E site visits and Preliminary Designs for Port Graham, Nanwalek, Eyak / Cordova, Valdez, Seward, facilities;
05-15-97:	Submit Port Graham, Nanwalek, Eyak / Cordova, Valdez, Seward Preliminary Designs to EVOS Restoration Office for Trustee review and authorization to proceed with construction documents and bidding;
06-01-97:	Issue solicitation request for bid proposals for off-site utilities and building construction for Port Graham, Nanwalek, Eyak / Cordova, Valdez, Seward facility projects;
07-30-97:	Complete construction and inspection of Chenega Bay and Tatitlek facilties, receive occupancy certification.
08-30-97:	Review and select bid proposals for Port Graham, Nanwalek, Eyak / Cordova, Valdez, Seward facility projects, submit to EVOS Restoration Office for Trustee review and authorization to proceed with off-site / on-site utilities, site preparation and building construction
07-04-98:	Complete construction and inspection of Port Graham, Nanwalek, Eyak / Cordova, Valdez, Seward facilties, receive occupancy certifications.

B. Project Milestones and Endpoints (continued)

Primary Project Phases

Each community project will proceed through each of the following phases:

PhaseI:	Community Needs Assessment and Concept Design
Phase II:	Topographic Survey, Soil Analysis, A&E Site Visit, and Preliminary Design
Phase III:	Financing Commitments, Construction Documents, Bidding Services
Phase IV:	Off-Site Utilities and Building Construction
Phase V:	Final Inspection and Occupancy

C. Project Reports

Standard summary project progress and accounting reports, for the communities and lead agencies, will be prepared monthly. Reports will address both region-wide and individual community progress.

Detailed project progress and accounting reports will be prepared on a quarterly basis. End of Phase Accomplishment Reports will be prepared for each community as they progress through each phase.

Other general accepted and required reports typical to a design, engineering, and construction project will be prepared by the NPRHA project coordinator, architects, engineers, contractors, etc..

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

In tandem with this facilities development and construction project, a region-wide consolidated facility services planning effort will be carried out. The facility services planning project will address coordination with and integration of restoration efforts - projects and programs.

EVOS investigators, reseachers, and scientists, and key state and federal natural resource management agencies, will be invited to participate in the concept and preliminary design phases for each community. The effort will include survey of the field office space needs of these participants and agencies, and determine the opportunities and merit for meeting these needs within the local community facilities.

The project will closely coordinate with and involve a variety of professional expertise; including the Kodiak Alutiiq Archaeological Repository, the Smithsonian Arctic Studies Center, the ANHRDP - Keepers of the Treasures, and appropriate University museum and curation departments.

Objective #1 provides for completion of a comprehensive region-wide Community Cultural Centers, Artifact Repositories, and Restoration Facilities Needs Assessment and Conceptual Design Study. The assessment will address and report on other coordination and integration opportunities.

ENVIRONMENTAL COMPLIANCE

An environmental assessment report will be prepared for each local community facility, by the NPR Housing Authority. Facility plans will be submitted to the National Oceanic and Atmospheric Administration for determination of compliance with the requirements of the National Environmental Policy Act.

It is anticipated documents filed as part of National Environmental Policy Act compliance will indicate that no mitigation measures will be needed to insure compliance.

PERSONNEL

The professional staff of the North Pacific Rim Housing Authority will provide project management and technical assistance services. Qualified architects, engineers, contractors will be engaged through competitive RFP solicitation. Resumes will be provided for EVOS Restoration Office review.

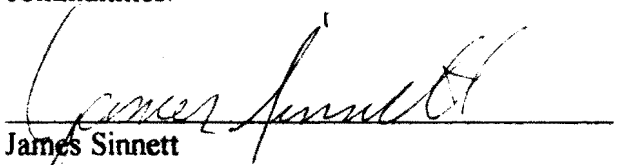
Project Title: **Community Cultural Centers, Repositories and Subsistence Restoration Facilities - Comprehensive Design, Engineering, Financing, and Construction Development Project**

John Schroeder, Project Leader
North Pacific Rim, Inc. Regional Housing Authority
4201 Tudor Centre Drive Suite 210
Anchorage, Alaska
Phone: (907) 562-1444
Fax: (907) 562-1445
e-mail address / available in August, 1995

Alaska Department of Environmental Conservation
or
Department of Interior, U.S. Forest Service / National Park Service
Mailing address
Phone number
Fax number
e-mail address, if known

Prepared this 29 th day of April, 1995

Submitted under authorization and on behalf of the participating Chugach region oil spill impacted communities.



James Sinnett
Chugach Heritage Foundation
4201 Tudor Centre Drive, Suite 210
Anchorage, Alaska 99508
Phone Number: (907) 561-3143
FAX Number: (907) 563-2891
e-mail address / will be available August, 1995.

CONCEPTUAL DESIGN STUDY

for the

CHENEGA CORPORATION

CHENEGA BAY, ALASKA

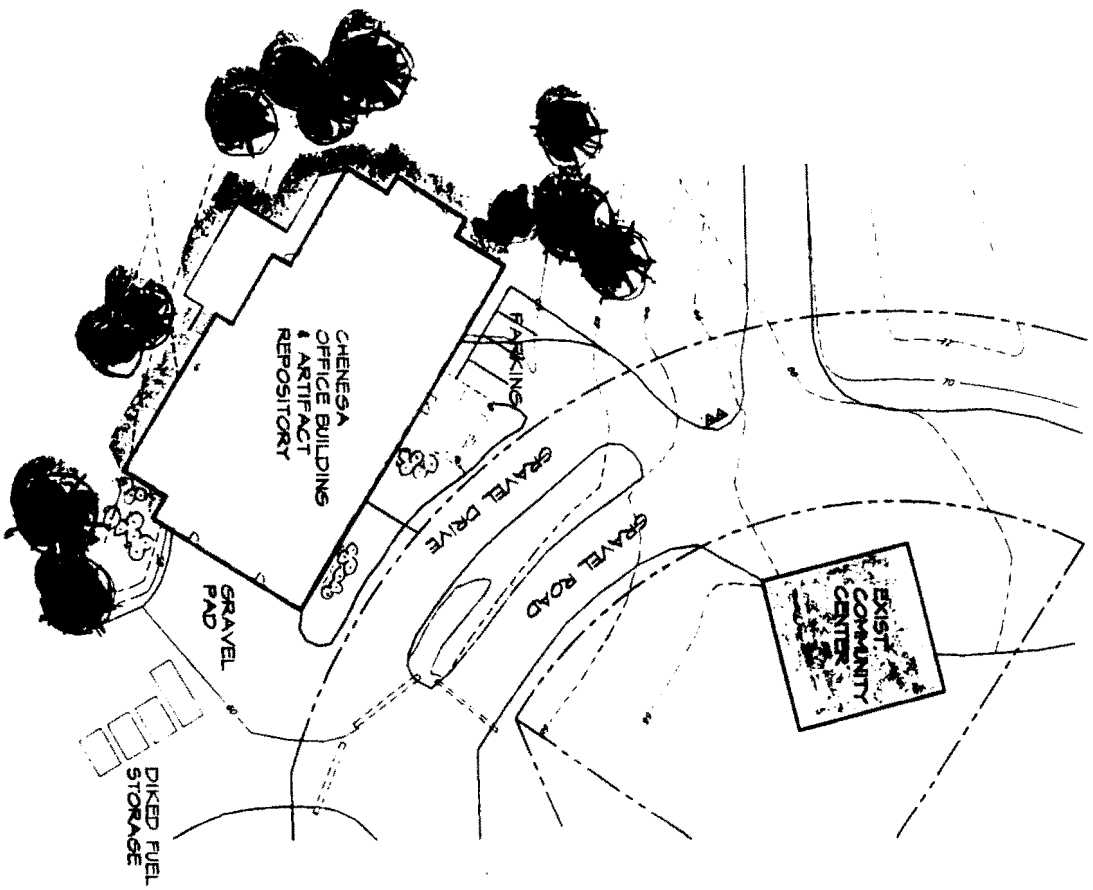
USKH

APRIL, 1995

OFFICE & ARTIFACT REPOSITORY BUILDING

APRIL, 1995

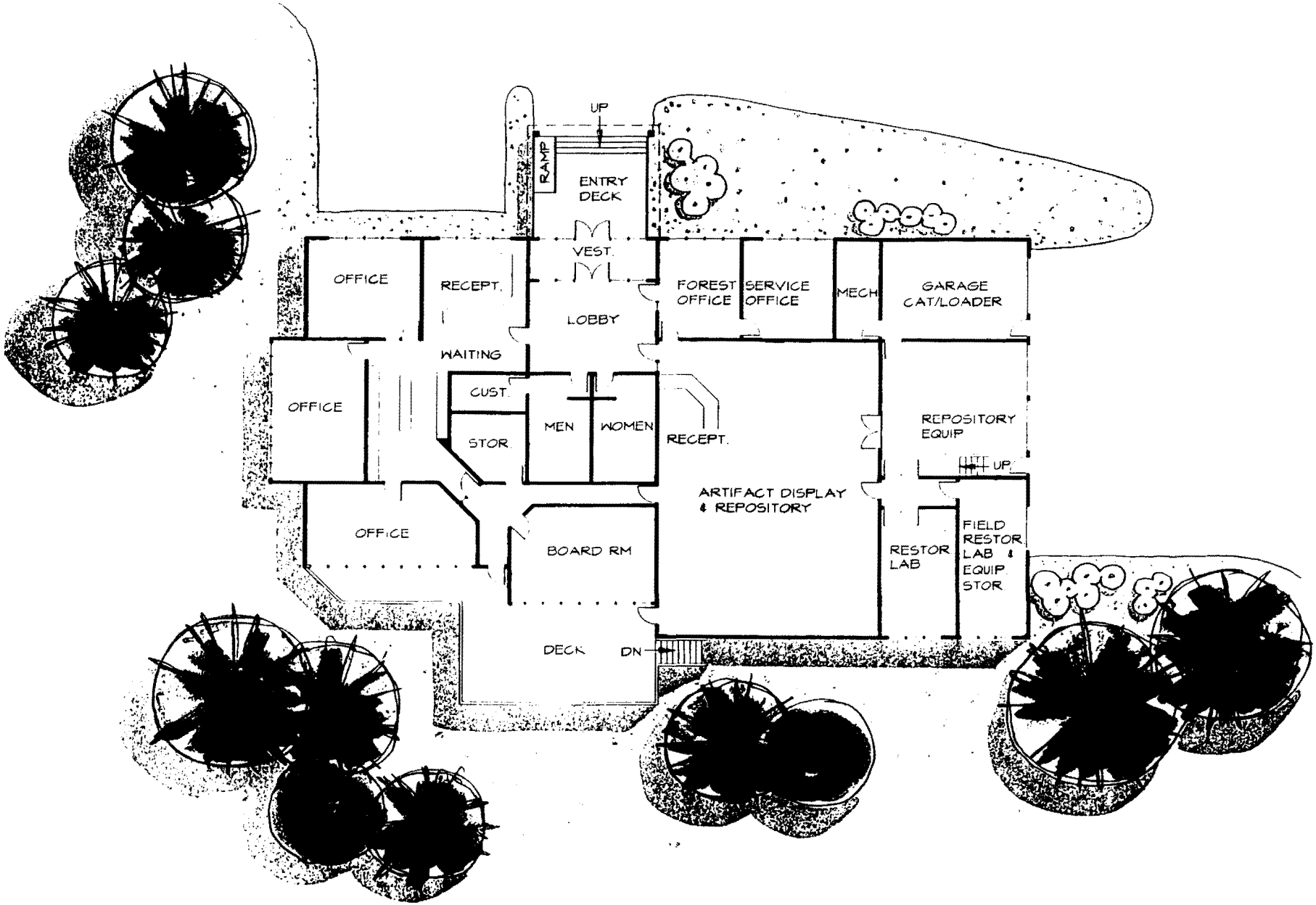
HKM



SITE PLAN

OFFICE & ARTIFACT REPOSITORY BUILDING

APRIL, 1995

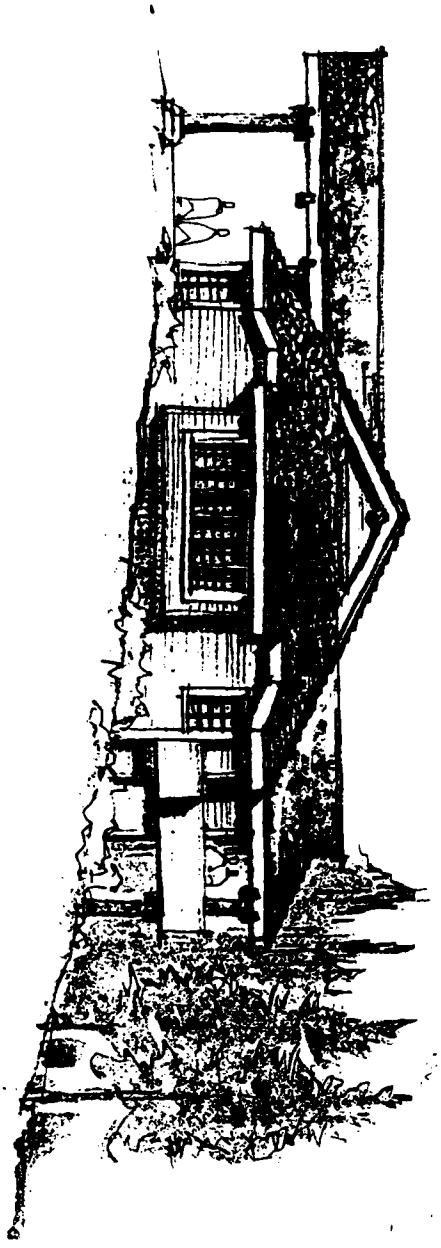


OFFICE & ARTIFACT REPOSITORY BUILDING

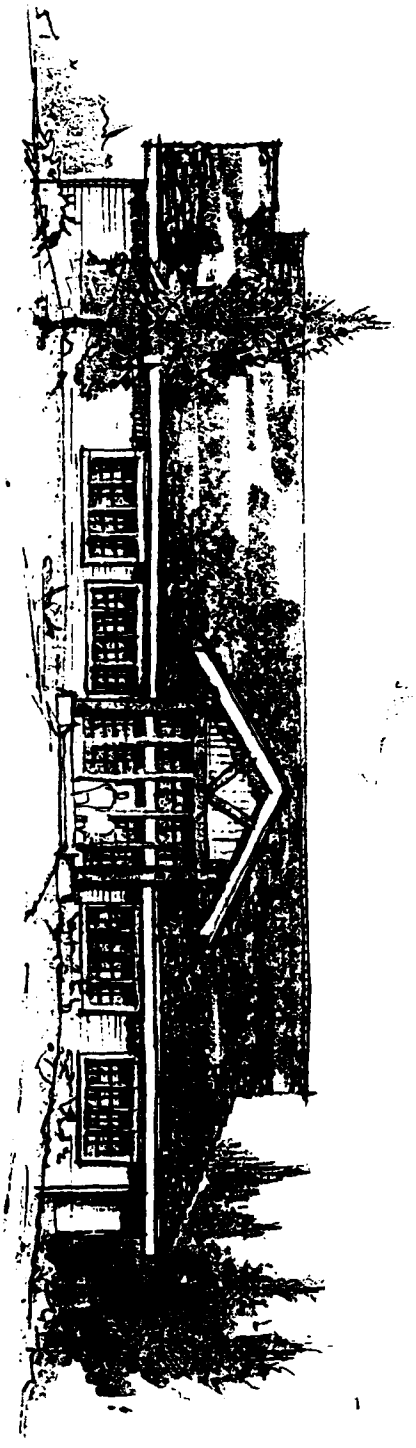
USKH

APRIL, 1995

REVISED 4/20



WEST



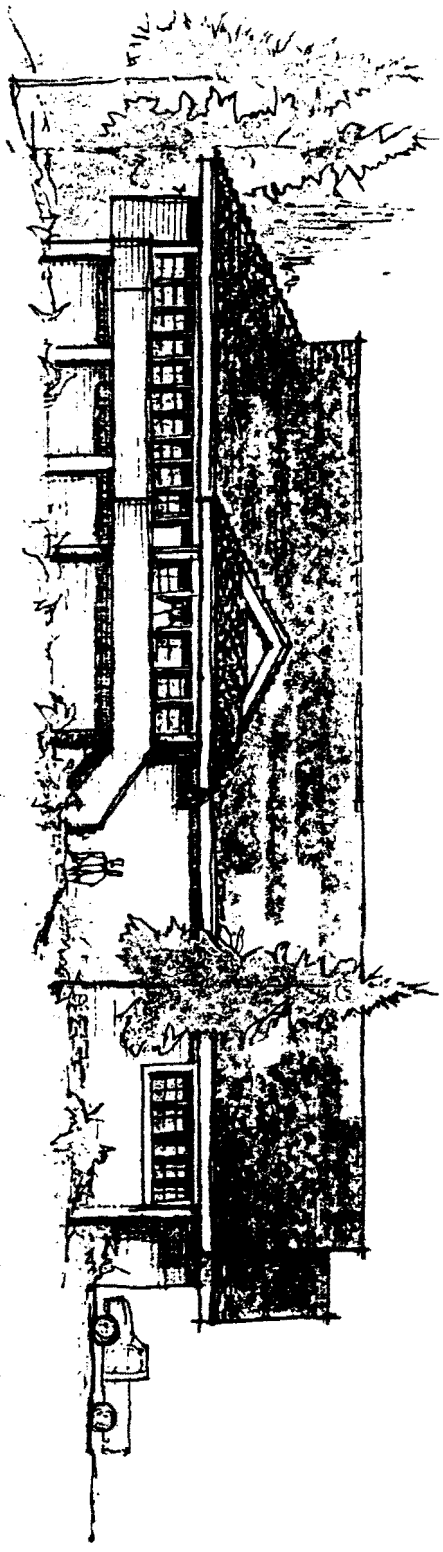
NORTH

ELEVATIONS

OFFICE & ARTIFACT REPOSITORY BUILDING

USGS

APRIL, 1995



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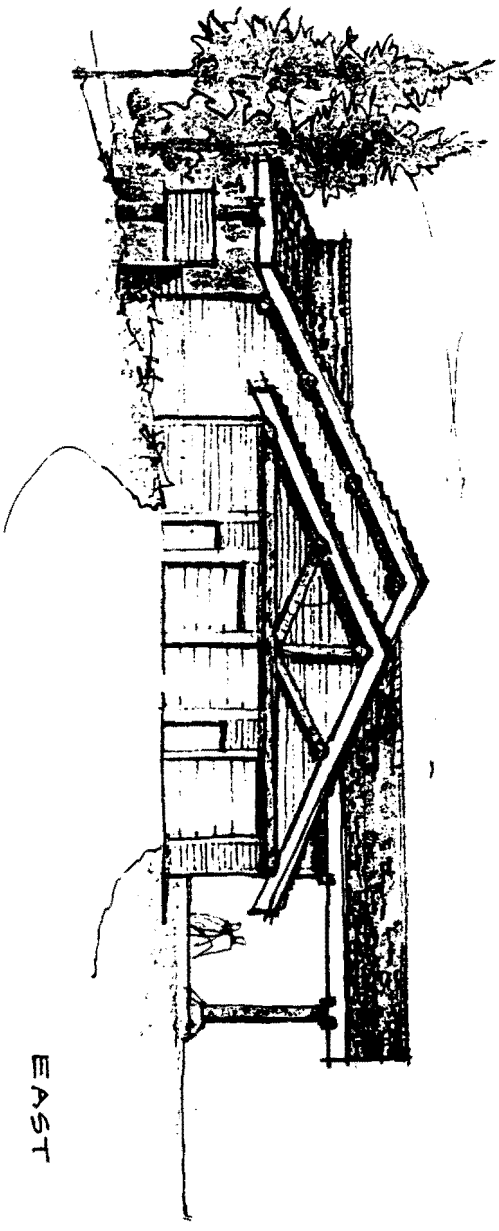

EAST

ELEVATIONS

OFFICE & ARTIFACT REPOSITORY BUILDING

USGH

APRIL 1995

REPOSITORY AND CHENEGA CORPORATION FACILITIES PROGRAMMED AREAS

REPOSITORY FACILITIES	SQUARE FEET
Artifact Display & Repository	2,100
Reception Area	170
Repository Lab & Work Room	336
Field Restoration Lab & Equipment Storage Area (to be used by other agencies or departments)	420
Repository Equipment & Loading Area	632
	3,658

CHENEGA CORPORATION OFFICES AND OTHER FACILITIES	
Reception/Waiting Room	430
Office Area 1	320
Office Area 2	380
Office Area 3	380
Conference & Board Room	420
Work Area & Coffee Room	280
Storage	140
Forest Service Offices	576
Garage for Loader	468
	3,394

COMMON AREAS	
Vestibule	160
Lobby	320
Toilets	360
Custodian	50
Mechanical	180
Exterior/Interior Walls & Circulation	678
	1,748

TOTAL SQUARE FOOTAGE	8,700

USKH

RESPECTIVE COSTS OF REPOSITORY FACILITIES/CHENEGA CORPORATION FACILITIES

Excluding common spaces shared by both, such as mechanical room, restrooms, lobbies, etc. The respective areas of the building are as follows:

Repository Facilities	3,658 sq. ft.	52%
Chenega Corporation Facilities	3,394 sq. ft.	48%
Total Square Footage less common space	7,052 sq. ft.	100%

Total Shared Cost of the Project $2,101,421

Respective Costs Based on Percentage of Building

Repository Facilities	2,101,421 X 52% + $200,000*	$1,292,738
Chenega Corporation Facilities	2,101,421 X 48%	1,008,682

Total Cost of the Project $2,301,420

*Repository/Display Cases and Specialized Furniture and Equipment

USKH

CHENEGA CORPORATION OFFICE AND ARTIFACT REPOSITORY BUILDING

Items	Costs
TOPOGRAPHIC SURVEY	7,500
SOIL ANALYSIS	6,000
SITE VISIT Architect Electrical Engineer Civil Engineer	4,800
PRELIMINARY DESIGN	30,000
CONSTRUCTION DOCUMENTS Architectural Civil Structural Mechanical Electrical	120,000
BIDDING SERVICES	8,000
CONSTRUCTION ADMINISTRATION SERVICES Shop Drawings Review Submittal Review Construction Administration Construction Inspection - 25 trips	 25,000 17,000
CA SUBTOTAL	42,000
REIMBURSEABLES Travel 30 trips @$550 each Per Diem 10 @$150 each Printing Bid Sets of Documents Review Documents, Photographs & Misc.	 16,500 1,500 5,000 3,000
REIMBURSEABLES SUBTOTAL	26,000
SUBTOTAL FOR COSTS AND CONSTRUCTION ADMINISTRATION COSTS	244,300
OFF-SITE UTILITIES Water/Sewer/Electrical/Telephone	 30,000
BUILDING CONSTRUCTION	1,827,121
TOTAL SHARED PROJECT COSTS	$ 2,101,421
REPOSITORY DISPLAY CASES & SPECIALIZED FURNITURE & EQUIPMENT	200,000
TOTAL PROJECT COSTS	$ 2,301,421

USKH

96154

LETTER OF TRANSMITTAL

To: **Exxon Valdez Oil Spill Trustees Council**
EVOS Restoration Office

From: **Jim Sinnett, Program Planner**
Chugach Heritage Foundation

Date: **May 1, 1995**

Re: **Final draft submission of EVOS FY-96 Project Application**

Project Title: **Chugach OSIR Community Repositories, Cultural Centers, Subsistence Restoration Facilities Comprehensive Services Development Planning Project**

Proposer: **Chugach OSIR Communities Consortium**: A Consortium of the Oil Spill Impacted Region (OSIR) Villages and Alaska Native Communities of Chenega, Tatitlek, Port Graham, Nanwalek, Eyak , Seward, and Valdez

Project Originator: **The Tatitlek Village IRA Council**

The following Project Application is submitted under authorization and on behalf of the participating Chugach region oil spill impacted communities. The project purposes were arrived at through discussion and consensus of the participating communities. It is expected that the project details will continue to be refined through the EVOS review process and EVOS negotiations with the participating communities. Chugach region communities, not having already done so, are to provide project application submission authorization letters by May 29, 1995. Final Resolutions of participation will be considered for adoption after review of the project as finally negotiated with the EVOS Trustees Council.

Given the limited time for preparation, The project applicants reserve and request opportunity to further refine this project application, and submit an amended version after initial EVOS review.

A detailed line-item project budget, prepared on the "Excell" software program, will be submitted after initial review is completed by the EVOS Restoration Office.

Project Title:	**Chugach OSIR Community Repositories, Cultural Centers, Subsistence Restoration Facilities Comprehensive Services Development Planning Project**
Project Number:	96154
Restoration Category:	General Restoration
Proposer:	**Chugach OSIR Communities Consortium**: A Consortium of the Oil Spill Impacted Region (OSIR) Villages and Alaska Native Communities of Chenega, Tatitlek, Port Graham, Nanwalek, Eyak , Seward, and Valdez
Project Originator:	**The Native Village of Eyak Tribal Council**
Lead Trustee Agency:	Department of the Interior: Forestry Service / National Park Service
Cooperating Agencies:	Alaska Department of Natural Resources, Department of Fish and Game, Department of Community & Regional Affairs
Regional Assistance:	Chugachmiut, Chugach Regional Resource Commission, Chugach Heritage Foundation, Chugach Alaska Corporation
Duration:	Multiple years / Three (3) fiscal years, FY 1996 to FY 1998
Cost FY 96:	$125,000
Cost FY 97:	$175,000
Cost FY 98:	$100,000
Geographic Area:	Chugach Region Oil Spill Area: a Service Delivery Area inclusive to all unincorporated and Alaska Native subsistence communities within the Chugach oil spill impacted region of the Lower Cook Inlet and Prince William Sound
Injured Resource/Service:	All Injured Resources

ABSTRACT

The **Chugach OSIR Community Cultural Centers and Subsistence Restoration Facilities Comprehensive Service Planning Project** purposes are to provide coordinated and cost effective / efficient approach to the provision and delivery of technical assistance planning services to each of the Chugach OSIR communities engaged in the development of a cultural center or subsistence restoration facility. The project is designed to facilitate a region-wide effort, coordinate and provide for the various technical service elements associated with and essential to the planning and development of community cultural centers or subsistence restoration facilities and their attendant long-term programs.

Project elements include, but are not limited to; facilitating community involvement in facility program service planning; the inventorying of local cultural center and subsistence program and sup-porting facility needs; discovering duplication and gaps in facility / center plans; exchanging specialized information relevant to restoration facility and cultural center development, subvention and other assistance; harmonious blending of various disparate elements for greater local / region-wide effectiveness and economy; and the research, development and securement of facility funding, bonding, and capital venture partnerships.

8/25/95 Version

Comprehensive Community Plan for Restoration of Archaeological Resources in Prince William Sound and Lower Cook Inlet

Project Number:	96154
Restoration Category:	General Restoration
Proposer:	Chugach Heritage Foundation
Lead Trustee Agency:	USFS
Cooperating Agencies:	DOI, ADNR
Duration:	1 year
Cost FY 96:	$206,300
Geographic Area:	Prince William Sound, Lower Cook Inlet
Injured Resource/Service:	Archaeological Resources

ABSTRACT

The proposed project would develop a comprehensive community plan for restoring archaeological resources in Prince William Sound and Lower Cook Inlet, including strategies for storing and displaying artifacts at appropriate facilities within the spill area. This plan would contribute to restoration objectives by protecting archaeological artifacts directly, increasing awareness and appreciation of cultural heritage, and replacing resources and services lost as a result of irretrievable damage to some artifacts.

INTRODUCTION

Residents of the spill area have expressed a strong interest in participating in the restoration of archaeological resources. Native communities within Prince William Sound and Lower Cook Inlet have voiced an especially strong interest in having artifacts that were collected during the spill response, damage assessment, and restoration returned to the spill area for storage and display. These artifacts contain information about the cultural heritage of people from the spill area.

Archaeological artifacts uncovered during the spill response are stored at the University of Alaska-Fairbanks by agreement with landowners and Exxon. Additional artifacts uncovered during damage assessment are stored in the Federal Building in Juneau. Still

more artifacts have been collected through restoration projects, such as the excavation of two of the injured archaeological sites in Prince William Sound: SEW–440 on Eleanor Island and SEW–488 (Louis Bay Lamp Site) on Knight Island. The collections include stone, bone, ivory, metal, peat samples, and water-logged wood samples.

The Alutiiq Archaeological Repository in Kodiak, whose construction costs were partly funded by Trustee Council, is the only appropriate artifact storage facility in the spill area. None of the four museums in Prince William Sound and Lower Cook Inlet (in Homer, Seward, Valdez, and Cordova) is presently capable of storing artifacts.

The *Invitation to Submit Restoration Projects for FY 96* indicated that proposals from local sponsors for local heritage preservation projects will be considered in the context of the *Spill Area Site and Collection Protection Plan* being developed by the Alaska Department of Natural Resources under Project 95007-A. A draft of this plan was completed in March 1995 and has been peer reviewed.

Three proposals for local heritage preservation projects have been received from communities in Prince William Sound and Lower Cook Inlet: a training program (96152), a facilities development project (96153), and a planning project (96154). The preliminary recommendation of the Executive Director is that the Trustee Council fund the planning project contingent on revision of the detailed project description and budget to provide for a comprehensive planning effort, and, furthermore, that the facilities development project and training program not be funded until planning is completed. This is the revised project description for a comprehensive community plan for restoration of archaeological resources in Prince William Sound and Lower Cook Inlet.

NEED FOR THE PROJECT

A. Statement of the Problem

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

Documented injuries include theft of surface artifacts, masking of subtle clues used to identify and classify sites, violation of ancient burial sites, and destruction of evidence in layered sediments. In addition, vegetation has been disturbed, which has exposed sites to accelerated erosion. The effect of oil on soil chemistry and organic remains may reduce or eliminate the utility of radiocarbon dating in some sites. Assessments of 14 sites in 1993 suggest that most of the archaeological vandalism that can be linked to the spill

occurred in 1989 before adequate constraints were put into place over the activities of oil spill cleanup personnel.

Comprehensive Program for Restoration of Archaeological Resources. The Trustee Council has developed a comprehensive program for restoring archaeological resources. It has three parts: site monitoring, data recovery, and local heritage preservation. Project 96154 continues work the Trustee Council initiated in 1994 to involve local communities in determination of an appropriate strategy for restoration of archaeological resources.

Monitoring. The monitoring program consists of periodic checks on a small number of sites to detect further damage from vandalism and looting, and hydrocarbon testing of a few sites to gauge the effect of oiling on archaeological deposits. In the two-year period 1995-1996, three sites will be monitored in Prince William Sound and four in Lower Cook Inlet.

Prior to FY 95, most injured archaeological sites were monitored every year since the spill. However, because recent surveys show no new disturbance of archaeological sites, injured sites will no longer be monitored every year. Because vandalism triggered by cleanup activities is expected to diminish within 15 years of the spill, Trustee agencies propose to monitor index sites periodically through the year 2004.

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

Site Stabilization and Data Recovery. In 1992, a multi-agency panel of experts recommended measures for restoring archaeological sites injured during the oil spill. In 1993 and 1994, site stabilization and data recovery was undertaken at 19 injured archaeological sites on state or federal land. In 1995, further restoration is scheduled for two of the injured archaeological sites in Prince William Sound: SEW–440 on Eleanor Island and SEW–488 (Louis Bay Lamp Site) on Knight Island. Both sites were heavily oiled; they were also damaged by high pressure water treatment during the oil spill cleanup. No similar effort is planned for subsequent years, although the monitoring program may reveal the need for further data recovery.

Local Heritage Preservation. In approving Project 94007, the Trustee Council asked the Alaska Department of Natural Resources (ADNR) to "Combine with Project 94386 (Archaeological Repositories - Planning and Design) to develop a cost-effective plan for protection of injured resources on public lands while involving local communities in determination of appropriate strategy."

In March 1995, ADNR produced a draft report entitled *Spill Area Site and Collection Protection Plan.* The draft report has been peer reviewed, but has not yet been finalized or endorsed by the Trustee Council. Furthermore, the recommendations in the draft report have been reviewed by legal counsel for the permissibility of funding them under the terms of the civil settlement. Nonetheless, the recommendations from this draft report are reproduced below because they are a crucial first step in a community plan for restoration of archaeological resources.

> The Trustee Council needs to consider measures which protect the artifact collections which are generated as a result of the EVOS and measures to protect damaged sites from continued damage. Methods of protection considered should include support for limited term programs developed for site protection as well as physical facilities. Projects given a high rating should be those which show cooperation with Spill Area groups or organizations.
>
> **Recommendation**: The Trustee Council should entertain proposals to either construct new regional repositories in the Prince William Sound area and the lower Cook Inlet area or support expansion of existing facilities in the two areas. Supporting expansion of existing facilities or partial support for multi-use facilities appears to be the most efficient and economic approach. Either approach needs to include strong consideration for meeting federal curatorial standards outlined in regulation 36 CFR, Part 79 and address the concerns of Native communities.
>
> **Recommendation**: The Trustee Council should entertain proposals for developing local storage and display of small collections of artifacts which come from local sites. Development of local storage and displays should be supported by training, professional advice, and materials. Local people should be trained to work with and interpret local collections.
>
> **Recommendation**: The Trustee Council should continue to support monitoring damaged sites for vandalism and future damage from buried oil. Monitoring could be accomplished through funding agency monitoring as now, support of a program of local site stewards to monitor sites, or a combination of methods. A site stewardship program involving local residents would be effective in the long term and should be strongly considered by the Council for funding.
>
> **Recommendation**: For the most efficient long term protection of damaged sites and sites newly damaged as a result of increased vandalism, the Trustee Council should support presentation of information about the cultural heritage of the Spill Area in order to educate people about the harm of site destruction. Educational efforts should be aimed at both Native and non-Native communities. training youth in traditional practices and values would be one significant method of education about the value of archaeological remains.
>
> *Spill Area Site and Collection Protection Plan* (draft), pp. 3-4

None of the archaeological artifacts collected during spill response, damage assessment, or restoration is stored within the spill area. Archaeological artifacts uncovered during the spill response are stored at the University of Alaska Museum in Fairbanks by agreement with landowners and Exxon. Artifacts collected during damage assessment are temporarily housed in the Federal Building in Juneau, but the U.S. Forest Service would like to transfer them to a permanent repository. Soon the U.S. Forest Service will have to decide where to store the artifacts collected from SEW-440 (Eleanor Island) and SEW-488 (Knight Island).

The proposed project would develop a comprehensive community plan for restoring archaeological resources in Prince William Sound and Lower Cook Inlet, including strategies for storing and displaying artifacts at appropriate facilities within the spill area. This plan would contribute to restoration objectives by protecting archaeological artifacts directly, increasing awareness and appreciation of cultural heritage, and replacing services lost as a result of irretrievable damage to some artifacts.

B. Rationale

The proposed project relates to the recovery objective for archaeological resources, which states:

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

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

The proposed planning project would implement the following restoration strategy set forth in the *Restoration Plan* (p. 39):

> *Protect sites and artifacts from further injury and store them in appropriate facilities.* Archaeological sites and artifacts could be protected from further injury through the reduction of looting and vandalism, or the removal of artifacts from sites and storage in appropriate facilities. Opportunity for people to view or learn about the cultural heritage of people in the spill area would also provide protection by increasing awareness and appreciation of cultural heritage and would replace services lost as a result of irretrievable damage to some artifacts.

C. Summary of Major Hypotheses and Objectives

The major objectives of this project are as follows:

1. A comprehensive community plan for restoring archaeological resources in Prince William Sound and Lower Cook Inlet. This objective will be met in the following ways:

   a. the plan will address all communities in Prince William Sound and Lower Cook Inlet (Cordova, Valdez, Tatitlek, Chenega, Seward, Port Graham, Nanwalek, Seldovia, and Homer);
   b. the plan will involve all four museums in Prince William Sound and Lower Cook Inlet (in Cordova, Valdez, Seward, and Homer) as well as the Alutiiq Archaeological Repository in Kodiak and the University of Alaska Museum in Fairbanks;
   c. the plan will address programs as well as facilities; and
   d. the plan will address long-term operation and maintenance as well as initial construction.

2. Local involvement in the restoration of archaeological resources in Prince William Sound and Lower Cook Inlet. This objective will be met in several ways, including participation of local residents in:

   a. developing a plan for restoring archaeological resources;
   b. designing and implementing restoration programs such as volunteer site stewardship; and
   c. long-term operation and maintenance of facilities that may result from this project.

3. If this project results in a recommendation to construct one or more regional archaeological repositories or display facilities, the following objectives and standards must be met:

   a. Storage facilities for artifacts collected from federal lands must meet the requirements of 36 CFR Part 79. They should also be accredited by the American Association of Museums.
   b. To the extent feasible, keep collections of archaeological collections together in one location so they can be studied as a whole.
   c. The long-term cost of operation and maintenance must be sustainable from sources other than the civil settlement.

D. Completion Date

A draft plan will be available March 15, 1996, and a final plan will be submitted to the

Trustee Council by September 30, 1996.

COMMUNITY INVOLVEMENT

The project will involve all spill-affected communities in Prince William Sound and Lower Cook Inlet and actively involve all four museums in the area and the University of Alaska-Fairbanks Museum. The communities in the planning area are Cordova, Valdez, Tatitlek, Chenega, Seward, Port Graham, Nanwalek, Seldovia, and Homer.

FY 96 BUDGET

Personnel	23.8
Travel	8.2
Contractual	159.6
Commodities	0.0
Equipment	0.0
Subtotal	191.6
Gen. Admin.	14.7
Total	206.3

PROJECT DESIGN

A. Objectives

1. A comprehensive community plan for restoring archaeological resources in Prince William Sound and Lower Cook Inlet. This objective will be met in the following ways:

   a. the plan will address all communities in Prince William Sound and Lower Cook Inlet (Cordova, Valdez, Tatitlek, Chenega, Seward, Port Graham, Nanwalek, Seldovia, and Homer);
   b. the plan will involve all four museums in Prince William Sound and Lower Cook Inlet (in Cordova, Valdez, Seward, and Homer) as well as the Alutiiq Archaeological Repository in Kodiak and the University of Alaska Museum in Fairbanks;
   c. the plan will address programs as well as facilities; and
   d. the plan will address long-term operation and maintenance as well as initial construction.

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a. developing a plan for restoring archaeological resources;
b. designing and implementing restoration programs such as volunteer site stewardship; and
c. long-term operation and maintenance of facilities that may result from this project.

3. If this project results in a recommendation to construct one or more regional archaeological repositories or display facilities, the following objectives and standards must be met:

a. Storage facilities for artifacts collected from federal lands must meet the requirements of 36 CFR Part 79. They should also be accredited by the American Association of Museums.
b. To the extent feasible, keep collections of archaeological collections together in one location so they can be studied as a whole.
c. The long-term cost of operation and maintenance must be sustainable from sources other than the civil settlement.

B. Methods

The proposed project will treat ADNR's draft report *Spill Area Site and Collection Protection Plan*, which was prepared under Project 94007, as Phase I of the planning process. This report describes the curatorial standards in 36 CFR Part 79, assesses the capabilities of local musuems, and inventories the facilities and programs in each community in the study area. The facility assessment proposed by Project 96154 will expand on the information in Project 94007 by conducting an inventory of spill-related artifacts from the study area to ascertain facility design requirements, evaluating alternatives for repositories and display facilities, and making site-specific recommendations.

Project 96154 will involve the Trustee Council Executive Director's office and state and federal lawyers in the plan's development to better frame policy and legal issues that need to be addressed before the Trustee Council decides whether to fund proposed facilities.

1. Conduct a comprehensive regionwide assessment of local facility needs. Conduct a comprehensive regionwide assessment and prepare a report of individual local community facility needs for the preservation, study and storage of archaeological artifacts collected from community locales in Prince William Sound and Lower Cook Inlet, and which may serve in further recovery of at-risk artifacts and provide facilities for local community site-stewardship of oil spill impacted archaeological sites.

Assure community and technical involvement. Project personnel / planning team will establish two working groups: 1) a community advisory planning group, and 2) a

technical assistance group.

1.0 Determine the need for archaeological repository(ies) in Prince William Sound and Lower Cook Inlet.

1.01 Document the size and nature of artifact collections uncovered from Prince William Sound and Lower Cook Inlet during spill response, damage assessment, and restoration, and estimate storage requirements.

(a) Interview managers of spill-related artifact collections in Fairbanks and Juneau to determine the number and type of artifacts from Prince William Sound and Lower Cook Inlet, and associated storage requirements.
(b) Estimate the number and type of artifacts resulting from data recovery at SEW-440 and SEW-488 and associated storage requirements.
(c) Inventory other archived information about these artifacts, such as videos and photographs at the University of Alaska Library in Fairbanks.

1.02 Develop alternatives, which may include:

(a) use of an existing facility (e.g., UAF Museum or Anchorage Museum),
(b) expansion of an existing facility in one location to serve the entire region (e.g., Alutiiq Archaeologiocal Repository or Pratt Museum),
(c) construction of a new facility in one location to serve the entire region,
(d) expansion of an existing facility or construction of a new facility in each area (Prince William Sound and the Lower Cook Inlet), and
(e) combination of an artifact repository with a multi-use facility.

1.03 Evaluate alternatives. Evaluation criteria will include at least the following:

(a) cost of construction,
(b) cost of maintenance and operation, and
(c) ease of access by spill-area residents and by investigators.

2.0 Determine and report on local and regional locations and primary use for facilities. Determine local facility locations acceptable to communities within Prince William Sound and Lower Cook Inlet and assist communities to reach a consensus on regional locations where archaeological artifact collections can be properly processed and stored so that they may be studied as a whole.

2.01 Review regionwide assessment results with communities.

2.02 Conduct public meetings on facilities location report.

3.0 Determine the needs of individual communities for display of artifacts and the standards and conditions for displays. Determine the standards for loans of artifacts and guidelines for the rotation of appropriate display of artifacts uncovered during the spill response, damage assessment, and restoration, and which convey useful information about the cultural heritage of people within the region.

3.01 Inventory existing facilities that may serve as suitable display sites.

3.02 Interview community residents and leaders to determine which kinds of artifacts they are interested in displaying and for what purpose.

3.03 Determine the requirements for safe temporary storage and display of the desired artifacts. Requirements for stone artifacts differs from those for ivory or bone.

3.04 Develop alternatives, which may include:

(a) Use of existing facilities (e.g., community museum or cultural center)
(b) Expansion of existing facilities to accommodate display of spill-related artifacts
(c) Construction of new facilities (only that part of the new facility dedicated to display of spill-related artifacts could be considered for funding from the civil settlement)
(d) Installation of an artifact display case in a new or existing facility
(e) Display replicas of artifacts, while preserving the original artifacts in a repository

3.05 Evaluate alternatives. Evaluation criteria will include at least the following:

(a) Cost of construction
(b) Cost of maintenance and operation

4.0 Develop a concept design. Determine a model concept design for facilities, scaled to meet the assessed needs and capacities of the local communities, which meet the requirements of 36 CFR Part 79 and which gives consideration to standards necessary for accreditation by the American Association of Museums. The concept design should address at least the following items:

4.01 Location of proposed facilities
4.02 Commitment of land
4.03 Ownership of facilities
4.04 Operational relationships between the repository and the display facilities

5.0 Develop a Facilities Financing Plan. Determine the local / regionwide estimated costs of construction, operation and maintenance of facilities and prepare a report on the options and mechanisms for the financing of the local community and regional facilities identified in the regionwide needs assessment.

5.01 Estimate local community and regionalized approach costs for:

(a) Design
(b) Construction
(c) Management, operations, and maintenance
(d) Training

5.02 Research and assess alternative sources of funding, including

(a) Criminal settlement funds
(b) TAPLA
(c) Local governments
(d) Native corporations or nonprofit organizations
(e) Private-sector financing institutions and foundations
(f) Federal-state grant and/or development funds

6.0 Conduct preliminary planning for related programs that may be offered by facilities attendant to archaeological artifacts

6.01 Evaluate the need for and interest in programs related to archaeological resources, such as interpretive display services and site stewardship programs.
6.02 Determine staffing requirements for any facilities or programs recommended in the plan.

7.0 Determine the attendant training requirements for management, operation, and maintenance of facilities and programs.

7.01 Identify attendant immediate and long-term training needs.

7.02 Research and assess alternative and supplemental sources of training resources, including but not limited to:

(a) University of Alaska-Fairbanks Museum Studies Program
(b) On-site training program offered by the University of Alaska-Fairbanks Museum
(c) Museum-Alaska, Inc.
(d) Alaska State Museum
(e) Smithsonian's Arctic Studies Center
(d) Alutiiq Archaeological Repository

8.0 Develop a draft plan based upon the regionwide assessment of facility needs, financing approaches, repository standards, support programs, and training. The draft plan should include the concept design, program plan, and finance plan.

8.01 The project planning team will prepare and present to the working groups, utilizing the assessment results and community and public review comments, a first draft outline.

8.02 The planning team and working groups will detail and prepare the first draft for community and technical review.

9.0 Present the draft plan to the following entities for review and comment:

9.01 communities in Prince William Sound and Lower Cook Inlet,
9.03 the Trustee Council Executive Director
9.02 the Trustee Council's Chief Scientist, and
9.04 state and federal attorneys.

10.0 Revise the draft plan based on public comments, and comments from the Executive Director, Chief Scientist, and legal counsel.

11.0 From the governing body of each affected community, obtain resolutions endorsing the plan.

12.0 Present the revised plan to the Trustee Council.

13.0 Prepare, publish, and distribute the final plan. (See ***Procedures for the Preparation & Distribution of Final Reports.***)

D. Location

The proposed planning project will address restoration of archaeological resources in Prince William Sound and Lower Cook Inlet. The planning area includes the communities of Cordova, Valdez, Tatitlek, Chenega, Seward, Port Graham, Nanwalek, Seldovia, and Homer.

SCHEDULE

A. Measurable Project Tasks for FY 96

October 1, 1995:	Startup and formal organization of working groups
November 1995:	Assessment of facility needs, including evaluation of alternatives
December 1995:	Assessment of training needs
January 1996:	Assessment field reports completed
February 15, 1996:	Community Review Conference of alternatives
Feb 15-Mar 15, 1996:	Develop the draft plan, including concept design, program plan, and financing plan.
March 15, 1996:	Submit draft plan to the Restoration Office
March 15-April 30, 1996:	45-day review period and public meetings
May 1-June 15, 1996:	Revise draft plan
July 15, 1996:	Submit revised report to the Restoration Office
August 15, 1996:	Present revised plan to the Trustee Council
September 30, 1996:	Submit final plan and project reports

B. Project Milestones and Endpoints

Objective 1. A comprehensive community plan for restoring archaeological resources in Prince William Sound and Lower Cook Inlet.

Milestones:	1/96	Assessment of facility and training needs
	3/96	Release draft plan
Endpoint:	9/96	Final plan

Objective 2. Local involvement in the restoration of archaeological resources in Prince William Sound and Lower Cook Inlet.

Milestones:	2/96	Community Review Conference on draft plan
	4/96	Complete 45-day review of draft plan and public meetings
Endpoint:	9/96	From the governing body of each affected community, resolutions endorsing the plan

Objective 3. If this project results in a recommendation to construct one or more regional archaeological repositories or display facilities, the following objectives and standards must be met:

a. Storage facilities for artifacts collected from federal lands must meet the requirements of 36 CFR Part 79. They should also be accredited by the American Association of Museums.
b. To the extent feasible, keep collections of archaeological collections together in one location so they can be studied as a whole.
c. The long-term cost of operation and maintenance must be sustainable from sources other than the civil settlement.

Milestones: 3/15 Concept design plan
3/15 Financing plan

Endpoint: 9/96 Final plan

C. Project Reports

The major project report is a comprehensive community plan for restoring archaeological resources in Prince William Sound and Lower Cook Inlet. The final report will include the following reports, which may or may not be included in their entirety in the comprehensive plan: a facility needs assessment, facility location report, concept design, program plan, financing plan, and training needs assessment.

Before the final plan is submitted to the Trustee Council, it must be endorsed by resolution of the governing body of each affected community. If dissenting views are expressed by any of the communities in the study area, every reasonable effort will be made to reconcile differences so that a regional consensus is reached. If irreconciliable differences remain, they will be thoroughly addressed in the final plan.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

The project will treat ADNR's draft report *Spill Area Site and Collection Protection Plan*, prepared under Project 94007, as Phase I of this planning process. The contractor will consult with the USFS regarding curation of artifacts collected under Project 96007B. The contractor will also consult with the Alutiiq Archaeological Repository with regard to training opportunities.

ENVIRONMENTAL COMPLIANCE

The project will comply with all applicable regulations. The U.S. Forest Service will be the federal lead agency for compliance with the National Environmental Policy Act.

PERSONNEL

To implement this project, the U.S. Forest Service intends to enter into a professional services contract with the Chugach Development Corporation through the Section 8a Minority Business Enterprise Program administered by the Small Business Administration. The Chugach Development Corporation would subcontract with the Chugach Heritage Foundation, which proposes advisory planning committees and a technical assistance group with the following composition:

Community Advisory Planning Committees

Facilities:	Training:
Chuck Totemoff	Gail Evanoff
Gary Komkoff	Cheryl Lettich

Technical Assistance Group

Dr. Lora A. Johnson	Program Manager, Chugach Heritage Parks and Archaeological Resources Program
James A. Huettl, AIA	Architectural Manager, USKH / Architects/Engineers for the Alutiiq Repository
John Schroder	Program Manager, North Pacific Rim Regional Housing Authority
Elstun Lauesen	
James Sinnett	Program Manager / Project Planner, Chugach Heritage Foundation
Mark Stahl	Lands Manager, Chugach Alaska Corporation Department of Lands

In addition, the following staff from Trustee agencies will participate in this project:

	U.S. Forest Service
Doug Reger	Alaska Department of Natural Resources
Don Calloway	National Park Service
Veronica Christman	Trustee Council staff

James Sinnett, Project Leader
Chugach Heritage Foundation
4201 Tudor Centre Drive, Suite 210
Anchorage AK 99508
Phone Number: (907) 561-3143
FAX Number: (907) 563-2891

Dave Gibbons, Project Manager
U.S. Forest Service
U.S. Department of Agriculture
P.O. Box 21628
Juneau AK 99802-1628
Phone Number: (907) 586-8784
FAX Number: (907) 586-7555

Date Prepared

1996 EXXON VALDEZ TRUS[illegible] COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	PROPOSED FFY 1996 TRUSTEE AGENCIES TOTALS					
			ADEC	ADF&G	ADNR	USFS	DOI	NOAA
Personnel	$0.0	$23.8						
Travel	$0.0	$8.2						
Contractual	$0.0	$159.6						
Commodities	$0.0	$0.0						
Equipment	$0.0	$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$0.0	$191.6	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration	$0.0	$14.7						
Project Total	$0.0	$206.3	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Full-time Equivalents (FTE)	0.0	0.4						
	Dollar amounts are shown in thousands of dollars.							
Other Resources	CHF/CAC	$94.5	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

Comments:

8/25/95 Version

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Lead Agency: USFS

FORM 2A
PROJECT
DETAIL

Prepared: 8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS					
			Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
Personnel		$11.0						
Travel		$4.8						
Contractual		$159.6						
Commodities		$0.0						
Equipment		$0.0						
Subtotal	$0.0	$175.4						
General Administration		$12.8						
Project Total	$0.0	$188.2						
Full-time Equivalents (FTE)		0.2						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: USFS

FORM 3A
AGENCY
PROJECT
DETAIL

Prepared: 8/21/95

1996 EXXON VALDEZ TRUST COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
*	Thompson	Program Manager	GS-13	1.0	6,000		6.0
	Vacant	Project Leader	GS-12	1.0	5,000		5.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		2.0	11,000	0	
Those costs associated with program management should be indicated by placement of an *.						**Personnel Total**	$11.0

Travel Costs:		Ticket	Round	Total	Daily	Proposed
PM	Description	Price	Trips	Days	Per Diem	FFY 1996
						0.0
	Tecnical Assistance Group:					0.0
	November and December 95: Planning Assessments					0.0
	RT Anchorage to Chenega Bay	250	2	2		0.5
	RT Anchorage to Tatitlik	250	2	2		0.5
	RT Anchorage to Port Graham/Nanwalek	300	2	2		0.6
	RT Anchorage to Seward	275	2	2		0.6
	RT Anchorage to Cordova	200	2	2		0.4
	RT Anchorage to Valdez	250	2	2		0.5
	RT Anchorage to Seldovia	200	2	2		0.4
	RT Anchorage to Homer	200	2	2		0.4
	TR Juneau to Anchorage for OGC	444	1	2	224	0.9
Those costs associated with program management should be indicated by placement of an *.					**Travel Total**	$4.8

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: USFS

FORM 3B
Personnel
& Travel
DETAIL

8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:	Proposed
Description	FFY 1996
Contract with Chugachmiut	159.6
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$159.6

Commodities Costs:	Proposed
Description	FFY 1996
Commodities Total	$0.0

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: USFS

FORM 3B
Contractual & Commodities DETAIL

8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	Inventory Agency

1996	Project Number: 96154 Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources Agency: USFS	FORM 3B Equipment DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS					
Personnel		$6.5						
Travel		$2.1						
Contractual		$0.0						
Commodities		$0.0						
Equipment		$0.0						
Subtotal	$0.0	$8.6	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration		$1.0						
Project Total	$0.0	$9.6						
Full-time Equivalents (FTE)		0.1						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: ADNR

FORM 3A
AGENCY
PROJECT
DETAIL

Prepared: 8/21/95

1996 EXXON VALDEZ TRUS[illegible] COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
	Doug Reger	Archaeologist II	18	1.0	6,500		6.5
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		1.0	6,500	0	
Those costs associated with program management should be indicated by placement of an *.						Personnel Total	$6.5

Travel Costs:		Ticket	Round	Total	Daily	Proposed
PM	Description	Price	Trips	Days	Per Diem	FFY 1996
						0.0
	Tecnical Assistance Group:					0.0
	November and December 95: Planning Assessments					0.0
	RT Anchorage to Chenega Bay	250	1	2		0.3
	RT Anchorage to Tatitlik	250	1	2		0.3
	RT Anchorage to Port Graham/Nanwalek	300	1	2		0.3
	RT Anchorage to Seward	275	1	2		0.3
	RT Anchorage to Cordova	200	1	2		0.2
	RT Anchorage to Valdez	250	1	2		0.3
	RT Anchorage to Seldovia	200	1	2		0.2
	RT Anchorage to Homer	200	1	2		0.2
						0.0
Those costs associated with program management should be indicated by placement of an *.					Travel Total	$2.1

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: ADNR

FORM 3B
Personnel
& Travel
DETAIL

8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Commodities Costs:	Proposed
Description	FFY 1996
Commodities Total	$0.0

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: ADNR

FORM 3B
Contractual & Commodities
DETAIL

8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	Inventory Agency

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: ADNR

FORM 3B
Equipment
DETAIL

8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS					
			Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
Personnel		$6.3						
Travel		$1.3						
Contractual		$0.0						
Commodities		$0.0						
Equipment		$0.0						
Subtotal	$0.0	$7.6						
General Administration		$0.9						
Project Total	$0.0	$8.5						
Full-time Equivalents (FTE)		0.1						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: DOI, NPS

FORM 3A
AGENCY
PROJECT
DETAIL

Prepared: 8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
	Don Calloway	Archaeologist		1.0	6,300		6.3
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		1.0	6,300	0	
Those costs associated with program management should be indicated by placement of an *.						Personnel Total	$6.3

Travel Costs:		Ticket	Round	Total	Daily	Proposed
PM	Description	Price	Trips	Days	Per Diem	FFY 1996
						0.0
	Tecnical Assistance Group:					0.0
	November and December 95: Planning Assessments					0.0
	RT Anchorage to Chenega Bay	250		2		0.0
	RT Anchorage to Tatitlik	250		2		0.0
	RT Anchorage to Port Graham/Nanwalek	300	1	2		0.3
	RT Anchorage to Seward	275	1	2		0.3
	RT Anchorage to Cordova	200		2		0.0
	RT Anchorage to Valdez	250	1	2		0.3
	RT Anchorage to Seldovia	200	1	2		0.2
	RT Anchorage to Homer	200	1	2		0.2
						0.0
Those costs associated with program management should be indicated by placement of an *.					Travel Total	$1.3

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: DOI, NPS

FORM 3B
Personnel
& Travel
DETAIL

8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Commodities Costs:	Proposed
Description	FFY 1996
Commodities Total	$0.0

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: DOI, NPS

FORM 3B
Contractual & Commodities DETAIL

8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	Inventory Agency

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Agency: DOI, NPS

FORM 3B
Equipment
DETAIL

8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996
Personnel		$45.0
Travel		$35.1
Contractual		$60.0
Commodities		$5.0
Equipment		$0.0
Subtotal	$0.0	$145.1
Indirect		$14.5
Project Total	$0.0	$159.6
Full-time Equivalents (FTE)		9.0
Other Resources	CHF/CAC	$94.5

LONG RANGE FUNDING REQUIREMENTS

Dollar amounts are shown in thousands of dollars.

Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002

Comments: Personnel costs include: 1@ .25 FTE Project Comprehensive Plan Coordinator: 1@ .25 FTE Archaeological Plan Coordinator; 1@ .25 FTE Facilities Plan Coordinator. Chugach Heritage Foundation will assign appropriate staff and staff time dedicated to the project. Travel expences include: Travel and Per diem for trips to designated communities within Chugach oil spill impacted area. Travel and Per diem for two trip to anchorage for all community advisory planning group members. Travel will also include one trip to Anchorage for policy members, e.g. elected community/village council members, and village corporation board members; to participate in community review conference. Contractual expences include: architactual and engineering services of USKH A&E for Kodiak facilities; financial planning services of Elstun Lauesen & Associates; the construction planning services of the North Pacific Rim Housing Authority; and the contractual training and program planning services of Chugachmiut, the regional tribal service organization. Commoditles costs include; printing of facility concept designs and draft review plans, printing of the final reports. Office space, equipment, faz and phone, office supplies, paper, etc. will be provided by Chugach Heritage Foundation.

1996

Prepared:

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Name: CAC and Chugach Heritage Foundation

FORM 4A
Non-Trustee
DETAIL

8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:			Months	Monthly		Proposed
	Name	Position Description	Budgeted	Costs	Overtime	FFY 1996
	Vacant	Project Comp. Plan Coord	3.0	5,000		15.0
	Vacant	Archaeological Plan Coord	3.0	6,670		20.0
	Vacant	Facilities Plan Coord	3.0	3,333		10.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	9.0	15,003	0	
					Personnel Total	$45.0

Travel Costs: Description		Ticket Price	Round Trips	Total Days	Daily Per Diem	Proposed FFY 1996
Tecnical Assistance Group:	No. Travelers					
November and December 95: Planning Assessments						
RT Anchorage to Chenega Bay	4	250	8	8		2.0
RT Anchorage to Tatitlik	4	250	8	8		2.0
RT Anchorage to Port Graham/Nanwalek	4	300	8	8		2.4
RT Anchorage to Seward	4	275	8	8		2.2
RT Anchorage to Cordova	4	200	8	8		1.6
RT Anchorage to Valdez	4	250	8	8		2.0
RT Anchorage to Seldovia	4	200	8	8		1.6
RT Anchorage to Homer	4	200	8	8		1.6
Community Advisory Planning Group						
October 95 and February 96 Planning Sessions						
RT Anchorage to Chenega Bay	2	250	4	10	150	2.5
RT Anchorage to Tatitlik	2	250	4	10	150	2.5
RT Anchorage to Port Graham/Nanwalek	2	300	4	10	150	2.7
RT Anchorage to Seward	2	275	4	10	150	2.6
RT Anchorage to Cordova	2	200	4	10	150	2.3
RT Anchorage to Valdez	2	250	4	10	150	2.5
RT Anchorage to Seldovia	2	200	4	10	150	2.3
RT Anchorage to Homer	2	200	4	10	150	2.3
					Travel Total	$35.1

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Name: CAC and Chugach Heritage Foundation

FORM 4B
Personnel
& Travel
DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Contractual Costs:		Proposed
Description		FFY 1996
Facilities A&E concept designs	15.0 contributed	15.0
Financing planning	10.0 contributed	25.0
Construction management plan	10.0 contributed	10.0
Training/Program standards plan		10.0
	Contractual Total	$60.0

Commodities Costs:		Proposed
Description		FFY 1996
Model facilities concept designs, sketch and CAD	15.0 contributed	0.0
Draft and final plan report publication		5.0
	Commodities Total	$5.0

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Name: CAC and Chugach Heritage Foundation

FORM 4B
Contractual & Commodities DETAIL

8/21/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	

1996

Project Number: 96154
Project Title: Comprehensive Community Plan for Restoration of Archaeological Resources
Name: CAC and Chugach Heritage Foundation

FORM 4B
Equipment
DETAIL

8/21/95

Note: CAC will contribute 15,000 for model facilities concept designs, sketch and CAD, 15,000 for facilities A&E concept designs, 10,000 for financing planning, and 10,000 for a construction management plan.

Note: Project Comprehensive Plan Coordinator. Will be responsible for overall project planning coordination of project and compilation and submission of draft and final reports to communities and EVOS restoration office and TC.

Note: Project Archaeological Plan Coordinator.
Will be responsible for coordination of projects archaeological planning objectives and the compilation and preparation of draft reports archaeological (artifacts training programs) components.

Note: Project Facilities Plan Coordinator. Will be responsible for coordination of projects' facilities planning objectives construction management, financing, compilation of draft reports for facilities component.

Note: Architectual & Engineering Planning Services. USKH: Jim Huett, A.I.A. principal Architectual Manager.

Note: Facilities and Programs Financing Planning Services. E. Lauesen and Company. Certified Economic Development Finance Professional, NDC.

Note: Construction Management and Facilities Operations Planning Services. North Pacific Rim Regional Housing Authority, State - Federal Contracted Service Agency.

Note: Program Standards and Training Assessment/Curriculum Planning Services. University of Alaska Fairbanks and National Parks Services - assigned professional staff time.

96155

P O BOX 103296
ANCHORAGE, AK 99510-3296
TELEPHONE: (907)279-5420

FAIRWEATHER PROPOSAL

PREPARED BY FAIRWEATHER WORKING GROUP

FOR

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL

APRIL, 1995

PROPOSED PRINCE WILLIAM SOUND INFORMATION SERVICE (PWSIS)

The proposed Fairweather integrated information system is designed to accept, process and store scientific and other information from studies and environmental data collection programs from Prince William Sound and then allow easy access for manipulation and display of the data.

Basic information from PWS studies will be converted to a common data format and stored on computer disk accessible to all researchers, government officials and other interested parties. Users would have a variety of access and display options;

* access from and Internet World Wide Web server
* access with a dial in modem
* download raw unprocessed data
* download processed data
* display processed data
* floppy disk or magnetic tape

The primary cost for the development of this system is in acquiring the data, converting the data where needed, developing the manipulation and display software, and purchasing the WWW server and modems. If this system were integrated with FFI's current weather, sea and sea ice information system, data from that system would also be available to users.
W

INTRODUCTION

Now there are many organizations involved in scientific research and data gathering in the Prince William Sound area. The diverse natural resources of the area demand a wide range of research and management capabilities. Creating an ecosystem based monitoring and information system for the federal, state, nonprofit institutes, agencies and programs would greatly benefit all concerned.

NEED FOR THE PROJECT

A> Statement of Problem

Not having readily available research data and restoration information allows for an unnecessary Duplication and time-consuming data gathering. That information that is available is not always accessible.

B> Rationale

If a central information service were available to all agencies involved in the restoration project it would greatly reduce duplication of data and allow for the immediate distribution of information such as; water quality, current profiles, sea surface temperature, shellfish distribution and zoo plankton and photoplankton distribution. Base line studies would be designed to use current existing data, historical data and simplified sampling programs for 365 days a year.
It would be important for ongoing research projects in need of current information to be able to find the data perhaps requiring a change of direction in their own areas.

C> Summary of Major Hypotheses and Objectives

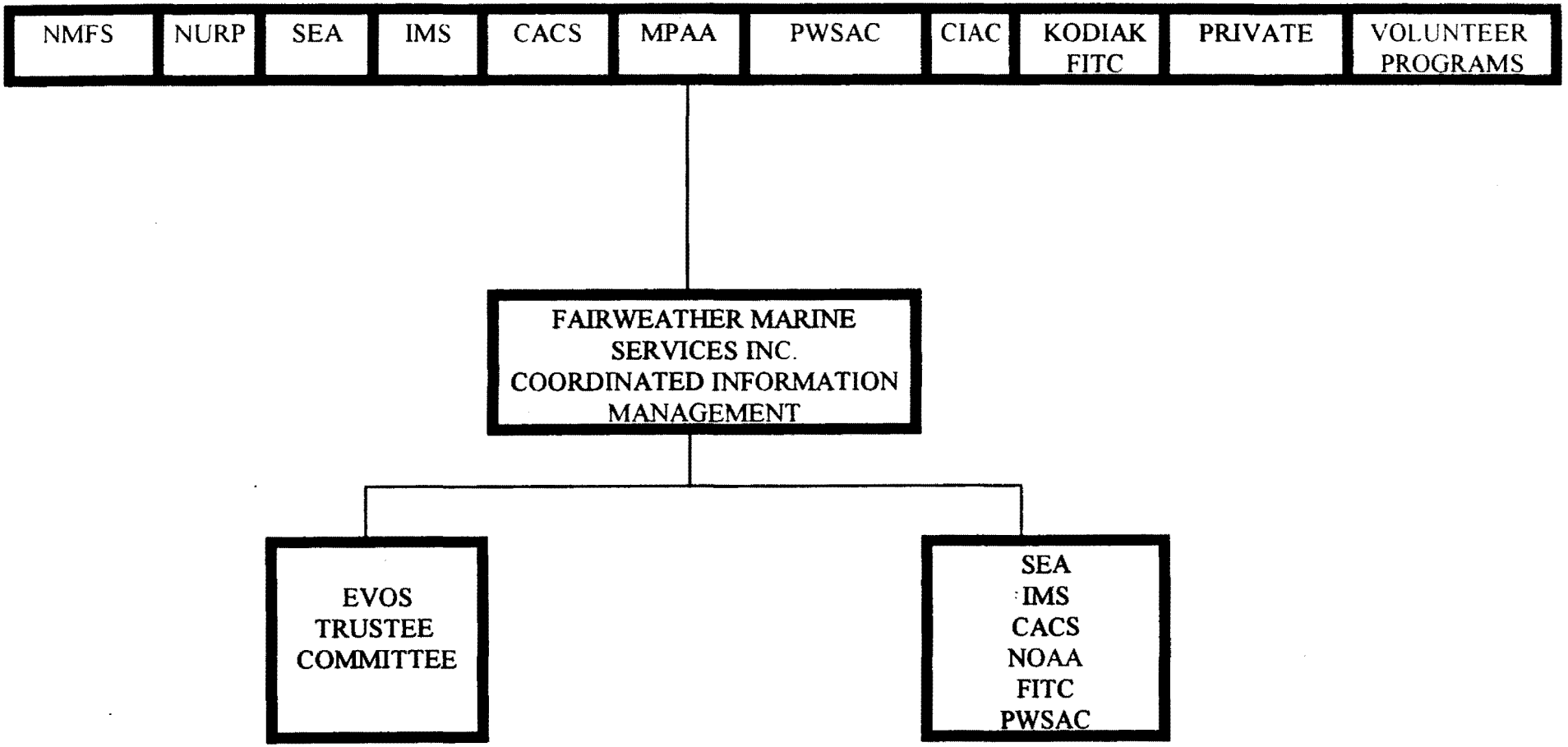
The objective of Fairweather's Prince William Sound Information Service is to collect, process and store scientific and other information from ongoing research projects in the EVOS area and allow easy access for use by federal, state, scientific agencies and EVOS.

D. Completion Date

This would be an ongoing service and available as long as restoration work is conducted in the area.

COMMUNITY INVOLVEMENT

Communities in the PWS area would have immediate and current information of work or research conducted in their areas. This service offered by Fairweather would also allow for weekly updates to be available and provide a means of community participation so that the Trustee Council and those directly involved in the work projects were aware of any concerns.


NMFS
NURP
SEA
IMS
CACS
MPAA
PWSAC
CIAC
KODIAK FITC
PRIVATE
VOLUNTEER PROGRAMS
FAIRWEATHER MARINE SERVICES INC. COORDINATED INFORMATION MANAGEMENT
EVOS TRUSTEE COMMITTEE
SEA
IMS
CACS
NOAA
FITC
PWSAC

R/V BERING EXPLORER

PRINCE WILLIAM SOUND SCIENCE CENTER

ANCHORAGE

SEWARD

Homer

KODIAK

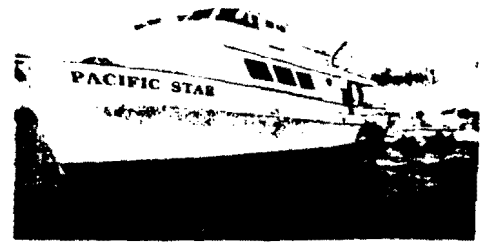
GULF OF ALASKA

THE CENTER FOR ALASKAN COASTAL STUDIES (KACHEMAK BAY)

Alaska Sea Life Center/IMS Improvements
January 1995 PROJECT UPDATE

OVERVIEW

The Alaska Sea Life Center/IMS Improvements project is developing high quality marine laboratory facilities in Seward that will provide new research opportunities for marine mammals, marine birds, fish and invertebrates. A unique aspect of the $47.5 million project ($24 million funded by EVOS Trustee Council) is the integration of marine research facilities with a public aquarium featuring the marine econsystem and research of the Gulf of Alaska.



- Summarized monthly data can be created for means, extremes, and duration of any measured meteorological or sea ice parameter as well as the probability occurrence of extreme and other specific values of these parameters.

Alaskan Meteorological Data: Fairweather maintains an extensive collection of real-time and climatological data in-house for immediate access. Some of this data for smaller towns and villages are not available in digital format elsewhere.

PROJECT EXPERIENCE

Weather and Marine Forecasts: Have been provided for all major oil companies operating onshore and in Alaskan waters of the Chukchi, Beaufort, and Bering Seas, the North Slope, Cook Inlet, Prince William Sound, and the Sea of Okhotsk in Russia. In addition, weather forecasts have been prepared for transportation, fishing, and other operations in Alaska.

Ice Analysis, Forecasts and Ice Management: Fairweather has provided ice management, ice analysis, and ice forecasts for all offshore oil exploration wells drilled in the Beaufort and Chukchi Seas since 1989. Long range forecast of breakup for ARCO for the Kuvlum well in 1993. Ice forecasts for fishing interests in the Bering Sea.

Environmental Monitoring: Fairweather is a member of the International Arctic Buoy Program and participates in those programs. Established and operated 4 weather stations for Exxon in Prince William Sound, Cook Inlet, and Kodiak Island. Provided observers for environmental monitoring during offshore exploration 1989-1993. Deployed an ARGOS buoy in the Arctic Ocean in 1992.

Scientific Studies: Environmental Studies for offshore aviation operations in the Kara Sea and the Yamal Peninsula, 1993. Created a long range forecast model for breakup in the Beaufort Sea, ARCO 1993. Many studies of weather and sea ice averages and extremes.

Major Clients: FFI has provided substantial services to BP, Exxon, Global Marine, ARCO, Marathon, Shell, Chevron, Amoco, CANMAR, Unocal, and others.

FACILITIES

A TeraScan downlink for the NOAA polar orbiting satellites. This system allows the acquisition of AVHRR (Advanced Very High Resolution Radiometer) data for an area covering a radius of approximately 3,000 miles centered in Anchorage, Alaska. The system also allows the receipt of data from all ARGOS platforms within the same area. This system is mobile and can be moved to cover other parts of the world.

SOFTWARE DEVELOPED IN-HOUSE

- **WxBase**: A weather database program for offshore and onshore oil rigs which conforms to MMS data collection requirements.

- **WxTutor:** A tutorial for training SAWRS weather observer certification.

- **IcePlot:** Calculates and plots ice vectors from radar tracking.

- **WxForecast:** A number of modules and models to aid weather and ocean forecasters.

- **Beaufort IceFcst:** A long range model for breakup in the Beaufort Sea.

- **IceDrift:** A short range (10 day) ice drift model for the Beaufort Sea.

- **SSMI-Decode:** Decodes and prepares for display passive microwave data from defense department satellites.

On site computer hardware include a Sun Sparc 2 workstation networked with two 80486 DOS machines for storing image data and a Novell network with a number of MS-DOS computers.

Weather observations and forecasts are obtained from NWS/FAA and commercial international data circuits. This data is fed to a communication program which strips unwanted material and stores the data where it can be accessed by workstations on the network. Surface pressure and other maps are obtained from the National Weather Service and from the Naval Oceanographic Data Center in Monterey, Calif.

PROFESSIONAL QUALIFICATIONS

Igor Appel, Senior Scientist and Principal, Ph.D, formerly the head of the Numerical Methods Laboratory in the Arctic and Antarctic Research Institute (AARI) in St Petersburg Russia. Dr. Appel has written or is the co-author of over 100 papers on the modeling and forecasting of sea ice state changes. His research is the basis for almost all ice forecast models at AARI.

Charles Samuels, Principal, has extensive training in electronics, computer science, and meteorology. Samuels was a Special Project Officer and Systems Analyst for the NWS until his retirement in 1986. In 1985 he received the Silver Medal award from the Department of Commerce for work in computerized weather data systems. Author of papers on using radar to detect and track hail (NWS) and coauthor of a paper on the use of satellite imagery to acquire ice edge information, published in Weather and Forecasting 1993.

Robert Thornley, Meteorologist, B.A. in math and science, M.B.A., from the University of Alaska. Graduate studies in air quality. Bob has extensive experience in Alaska weather having served as an Air Force Forecaster at Elmendorf Air Force Base. As a meteorologist for the engineering firms of ENSR, Dames and Moore and Northern Technical Services Bob forecast for drilling operations in the Bering Sea and oil spill cleanup operations in Prince William Sound as well as preparing statistical climate analyses for engineering projects.

Jay Hull, Meteorologist, retired from the National Weather Service in 1988 and has extensive experience in Alaska, having served as Meteorologist in Charge of the weather station in Kodiak, Alaska. Jay has also been in charge of the NWS radar station at Cape Hatteras, Virginia. He worked as an ice analyst and communications officer at the Anchorage Forecast Office.

Del Trobak, Ice Analyst, has over 20 years of experience managing ice monitoring activities in support of offshore drilling operations. Del supervised Fairweather's ice management activities in the Chukchi Sea and Beaufort Seas since 1989. He played an active role in the development of CANMAR's Ice Management and Alert System. Del works as consultant and part time employee.

Robert Fett, Research Meteorologist, Mr Fett retired from his position as the head of the Forecast Guidance Branch of the Naval Research Laboratory in Monterey, California in 1992 and now serves on special projects and as a consultant to Fairweather Forecasting. Bob has published many papers on satellite meteorology.

V

Project Title: **Surveys to Monitor Marine Bird Abundance in Prince William Sound during Winter and Summer 1996**

Project Number:	96159
Restoration Category:	Monitoring
Proposer:	Migratory Bird Management, U. S. Fish and Wildlife Service
Lead Trustee Agency:	U. S. Department of the Interior, Fish and Wildlife Service
Cooperating Agencies:	None
Duration:	Every other year until recovered
Cost FY 96:	$262,900 surveys
Cost FY 97:	$25,000 report writing
Cost FY 98:	$~260,000 surveys
Cost FY 99:	$~25,000 report writing
Cost FY 00:	$~260,000 surveys
Cost FY 01:	$~25,000 report writing
Cost FY 02:	$~260,000 surveys
Geographic Area:	Prince William Sound
Injured Resource/Service:	marine birds and sea otters

ABSTRACT

We propose to conduct small boat surveys to monitor abundance of marine birds and sea otters (*Enhydra lutris*) in Prince William Sound, Alaska during March and July 1996. Previous surveys have observed >65 bird and 8 marine mammal species in Prince William Sound. We will use data collected in 1996 to examine trends from summer 1989-96 and from winter 1990-96 by determining whether populations in the oiled zone changed at the same rate as those in the unoiled zone. We will also examine overall population trends for the Sound from 1989-96. Due to the lack of data prior to the *Exxon Valdez* oil spill, continued monitoring of marine birds and sea otters is needed to determine trends in abundance to determine whether population injured by the spill are recovering. Winter 1990-94 data indicated that goldeneyes (*Bucephala* spp.) and mergansers (*Mergus* spp.), which were not considered injured, may show residual effects from the oil spill. Continued monitoring using similar methods will confirm this.

INTRODUCTION

The waters and shorelines of Prince William Sound support abundant marine bird and sea otter populations throughout the year (Isleib and Kessel 1973, Hogan and Murk 1982, Irons et al. 1988a). Potential injuries to marine birds from exposure to the *T/V Exxon Valdez* oil spill included, but were not limited to, death, changes in behavior, and decreased productivity. U. S. Fish and Wildlife Service, Migratory Bird Management conducted boat surveys in Prince William Sound prior to the *Exxon Valdez* oil spill in 1972-73 (Dwyer et al. 1976) and 1984-85 (Irons et al. 1988a,b). After the oil spill, Natural Resource Damage Assessment Bird Study Number 2 (Burn 1994, Klosiewski and Laing 1994) was initiated to document damage from the oil spill on the marine bird and

sea otter populations of Prince William Sound. Data from these surveys indicated that populations of sea otters (Burn 1994) and several marine bird species (Klosiewski and Laing 1994) declined in the oil spill area. Thus, restoration projects 93045 (Agler et al. 1994a) and 94159 (Agler et al. 1995a) were initiated to continue monitoring marine bird and sea otter population abundance to assess recovery of injured species. Both restoration projects 93045 and 94159 continued the original *Exxon Valdez* oil spill damage assessment study (Bird Study Number 2, Burn 1994, Klosiewski and Laing 1994) from 1989-91.

Neither winter 1990-94 nor summer 1989-93 data of the Prince William Sound sea otter population show any difference in the rate of change between the oiled and unoiled zones. There has been no significant trend in the total number of sea otters from either the winter or summer data.

Using small boat surveys, this project will collect additional information to monitor the distribution and abundance of marine birds and sea otters in Prince William Sound. These data will be combined with data collected in 1989-91 (Klosiewski and Laing 1994), 1993 (Agler et al. 1994a), and 1994 (Agler et al. 1995a) to examine trends in marine bird and sea otter distribution and abundance. This project will benefit restoration of Prince William Sound by determining whether populations that declined due to the spill are recovering and by identifying what species are still of concern.

NEED FOR THE PROJECT

A. Statement of the Problem

Almost 30,000 marine bird (Piatt et al. 1990) and 900 sea otter (DeGange and Lensink 1990) carcasses were recovered following the *Exxon Valdez* oil spill. Based on modeling studies using carcass search effort and population data, an estimated 300,000 - 645,000 marine birds were killed in Prince William Sound and the northern Gulf of Alaska (Ecological Consulting, Inc. 1991). Garrott et al. (1993) estimated that 2,800 sea otters also were killed. These estimates are probably low, because they only include direct mortality occurring in the first five months after the spill.

The U. S. Fish and Wildlife Service conducted boat surveys of marine bird and sea otter populations in Prince William Sound in 1972-73 (Dwyer et al. 1976), 1984-85 (Irons et al. 1988b), and several years following the spill (1989, 1990, 1991, Klosiewski and Laing 1994; 1993, Agler et al. 1994a; and 1994, Agler et al., 1995a). Klosiewski and Laing (1994) documented overall declines in 15 species or species groups between 1972-73 (Dwyer et al. 1976) and the years after the spill. When comparing population estimates with 1984-85 data, Klosiewski and Laing (1994) documented decline of 6 species or species groups.

Burn (1994), using data from the boat surveys, documented declines in sea otter abundance in shoreline habitats of Prince William Sound following the spill. Burn (1994) detected a continuing pattern of significantly lower sea otter densities in oiled

coastal areas, suggesting mortality in or displacement of sea otters from these areas.

Agler et al. (1994a, 1995a) examined whether species shown to decline (Klosiewski and Laing 1994) have recovered. Agler et al. (1994a) found that some populations may still be declining (ie.- goldeneyes in March, surfbird in July), but that most species or species groups showed no trends in population abundance since the *Exxon Valdez* oil spill. Agler et al. (1995a) found that for winter bird populations, goldeneyes and mergansers may still show effects as a result of the oil spill. Other results were inconclusive due to the few years of data available. Klosiewski and Laing (1994) used Monte Carlo simulations to examine the power of determining trends from these data. These simulations showed that the number of surveys conducted has a large influence on whether a trend can be detected.

This project is designed to monitor the marine bird and sea otter populations of Prince William Sound. Within the broad category of marine birds, common murre, harlequin duck, marbled murrelet, and pigeon guillemot are injured resources that are not recovering. Bald eagles and black oystercatchers are believed to be recovering, but sea otters are not recovering from the *Exxon Valdez* oil spill. As mentioned above, recent results indicated that goldeneyes and mergansers may also have been injured by the spill (Agler et al. 1995a), but this injury was not previously detected due to limited data on marine bird abundance within Prince William Sound prior to the oil spill.

B. Rationale

Restoration of marine bird and sea otter populations requires population estimates to determine whether recovery is occurring or if species are still affected by the oil spill. This project will benefit marine birds and sea otters by revealing species that show continuing injury due to the *T/V Exxon Valdez* oil spill. Agler et al. (1994a, 1995a) found additional populations that were not previously shown to be injured. Survey data from this project have also been used by investigators of other studies on pigeon guillemots (G. Sanger, pers. comm.), marbled murrelets (K. Kuletz, pers. comm.), harlequin ducks (D. Rosenberg, pers. comm.), sea ducks (K. Laing and D. Essler, pers. comm.), black oystercatchers (B. Andres, pers. comm.), birds and forage fish (W. Ostrand, pers. comm.), herring (E. Brown, pers. comm.), and sea otters (Burn 1994).

This project relates to the restoration objectives of several species. The *Exxon Valdez Oil Spill Restoration Plan* (*Exxon Valdez* Oil Spill Trustee Council 1994) lists each species' restoration objectives separately, and we have only included objectives relating to this project:

> Harlequin duck - "will have recovered when breeding and postbreeding season densities and production of young have returned to estimated pre-spill levels, or when there are no differences in these parameters between oiled and unoiled areas."
>
> Marbled murrelet - "will have recovered when population trends are increasing."

Bald eagle -"will have recovered when their population and productivity return to pre-spill levels."

Black oystercatchers - "will have recovered when populations attain pre-spill levels"

Pigeon guillemot - "will have recovered when populations are stable or increasing."

Sea otter - "will be considered recovered when population abundance and distribution are comparable to pre-spill abundance and distribution"

All of the above recovery objectives relate to determining the population abundance of injured species. This is critical to determining recovery for most species. We propose to sample the entirety of Prince William Sound during March and July 1996 to estimate population abundance and distribution of marine birds and sea otters. Data will be comparable with pre- and post-spill data collected by the U. S. Fish and Wildlife Service (Dwyer et al. 1976, Irons et al. 1988a,b, Agler et al. 1994a, Klosiewski and Laing 1994, Agler et al. 1995a) and can be used to examine trends in abundance for these species.

Although Klosiewski and Laing (1994) found evidence of oil spill damage for loons, cormorants, scoters, mew gull, arctic tern, and northwestern crow, these species have never been added to the list of injured species and do not have restoration objectives. At the present time, this proposed study is the only study continuing to consider these species and track their populations.

The last summer survey was conducted in 1993 and the most recent winter survey was conducted in 1994, giving a 3-year gap in the summer and a 2-year gap in the winter data. Two years ago, a recommendation was made to reduce survey frequency from year to every third year. This schedule was not suggested by the U. S. Fish and Wildlife Service.

To address the question of appropriate survey frequency, we conducted a power analysis to examine the ability to determine trends in abundance (Gerrodette 1987). This analysis suggests that the present monitoring schedule should be reconsidered and expectations for future monitoring efforts must be clarified. It is unclear whether monitoring surveys, such as the one proposed here, will be continued after the year 2000 or what time span is expected for recovery to occur. If all other parameters are equal, power is determined by the number of surveys conducted in a given period of time. Thus, biannual surveys would reveal trends in population abundance earlier than surveys conducted every third year. To provide an accurate recommendation of survey frequency, we need to know how long such monitoring may persist and how quickly recovery needs to be determined. We recommend that these surveys be conducted biannually to achieve 95% probability of detecting a 10% annual rate of change in 20 years.

C. Summary of Major Hypotheses and Objectives

The purpose of this study is to obtain marine bird and sea otter population estimates in Prince William Sound to monitor the recovery of species that were injured by the *Exxon Valdez* oil spill and to determine whether other species may still be showing affects of the spill. To do this, we will compare population estimates within the oiled area with estimates from the unoiled area, thus, we are assuming that marine bird and sea otter populations are changing (either increasing or decreasing) at the same rate in both areas. We will also examine overall trends in marine bird and sea otter abundance using regression analyses.

D. Completion Date

This is an ongoing project. Continuous monitoring needs to be conducted to ascertain trends in population abundance within Prince William Sound. Also, we need to continue to monitor marine bird and sea otter populations within the Sound in the unlikely event that another large environmental perturbation occurs. Few pre-spill data were available before the *Exxon Valdez* oil spill, making it extremely difficult to determine what species were injured and to what extent (Klosiewski and Laing 1994).

COMMUNITY INVOLVEMENT

We would be happy to provide informational meetings in communities within Prince William Sound, as permitted by our survey schedule.

FY 96 BUDGET

Personnel	142.3
Travel	13.6
Contractual	45.1
Commodities	35.9
Equipment	1.5
Subtotal	238.4
Gen. Admin.	24.5
Total	262.9

PROJECT DESIGN

A. Objectives

The purpose of this study is to obtain population estimates of marine birds and sea otters in Prince William Sound to monitor the recovery of species whose populations may have declined due to the *T/V Exxon Valdez* oil spill and to determine whether additional

species may still be affected by the oil spill. The specific objectives of this project include:

1. To determine distribution and estimate population abundance, with 95% confidence limits, of marine bird and sea otter populations in Prince William Sound during March and July 1996;

2. To determine whether the marine bird species whose populations declined more in oiled areas than in non-oiled areas of Prince William Sound have recovered;

3. To determine whether additional species show any oil spill effects;

4. To support restoration studies on harlequin duck, black oystercatcher, pigeon guillemot, marbled murrelet, sea ducks, and sea otter by providing data on population changes, distribution, and habitat use of Prince William Sound populations.

B. Methods

1. Study Area

Our study area includes all waters within Prince William Sound and all land within 100 m of shore (Fig. 1). We exclude Orca Inlet, near Cordova, Alaska and the southern sides of Montague, Hinchinbrook, and Hawkins Islands (Klosiewski and Laing 1994).

2. Sampling Methods

Survey methodology and design will remain identical to that of post-spill surveys conducted by the U. S. Fish and Wildlife Service in 1989, 1990, 1991, (Klosiewski and Laing 1994), March and July 1993 (Agler et al. 1994a), and March 1994 (Agler et al. 1995a). We will conduct two surveys: one during March and another during July 1996. We will use three 7.7 m fiberglass boats traveling at speeds of 10-20 km/hr to survey transects over two 3-week periods. For each survey, two observers will survey a sampling window 100 m on either side, ahead of, and above the vessel (Klosiewski and Laing 1994). When surveying shoreline transects, observers will also record sightings on land within 100 m of shore. Observers will sample continuously and use binoculars to aid in species identification. Observers will practice estimating distances with a duck decoy, and radars on the survey vessels will be used to assist in determining our distance from land on shoreline transects. We will survey most transects when wave height is <30 cm, and we will not survey when wave height is >60 cm.

We will continue to use a stratified random sampling design containing three strata: shoreline, coastal-pelagic, and pelagic (Klosiewski and Laing 1994). The shoreline stratum will consist of waters within 200 m of land. Irons et al. (1988b) divided this stratum, by habitat, into 742 transects with a total area of 820.74 km^2. We will locate shoreline transects by geographic features, such as points of land, to facilitate orientation in the field and to separate the shoreline by habitat (Irons et al. 1988a,b).

Shoreline transects will vary in size, ranging from small islands with <1 km of coastline to sections of the mainland with over 30 km of coastline. Mean transect length will be 5.55 km. During winter, we plan to survey 99 shoreline transects, but this number varies among years, due to weather conditions and ice blockage. During summer, we plan to survey 212 shoreline transects. All transects were randomly chosen, and the same transects are used each survey (Klosiewski and Laing 1994).

To sample the coastal-pelagic and pelagic strata of Prince William Sound, we will divide the study area into 5-minute latitude-longitude blocks. When a block includes >1.8 km of shoreline, we will classify it in the coastal-pelagic stratum, and we will classify blocks with $\leq$1.8 km of shoreline in the pelagic stratum (Klosiewski and Laing 1994). When coastal-pelagic or pelagic blocks intersect the 200 m shoreline stratum, they will be truncated to avoid overlap. We plan to survey 2 north-south transect lines, 200 m wide each, located 1 minute inside the east and west boundaries of each coastal-pelagic and pelagic block. We will use Global Positioning Systems and nautical compasses to navigate transect lines. In the coastal-pelagic stratum, we plan to survey $\leq$29 blocks in the winter and $\leq$46 blocks in the summer. In the pelagic stratum, we plan to survey $\leq$25 blocks during both seasons.

3. Poststratification by Oiling

To examine population trends over time and to determine if populations injured by the spill are recovering, we will poststratify Prince William Sound into two zones, oiled and unoiled, based upon the pattern of oiling by the *Exxon Valdez* oil spill (Klosiewski and Laing 1994).

4. Statistical Analyses

As in previous surveys (Klosiewski and Laing 1994, Agler et al. 1994a,b,c, 1995a,b), we will use a ratio estimator (Cochran 1977) to estimate population abundance. Shoreline transects will be treated as a simple random sample; whereas, the coastal-pelagic and pelagic transects will be analyzed as two-stage cluster samples of unequal size (Cochran 1977). To do this, we will estimate the density of birds counted on the combined transects for a block and multiply by the area of the sampled block to obtain a population estimate for each block. We then will add the estimates from all blocks surveyed and divide by the sum of the areas of all blocks surveyed. We will calculate the population estimate for a stratum by multiplying this estimate by the area of all blocks in the strata. Population estimates for each species and for all birds in Prince William Sound will be calculated by adding the estimates from the three strata, and we will calculate 95% confidence intervals for these estimates from the sum of the variances of each stratum (Klosiewski and Laing 1994).

Population estimates for each species will be combined with other post-oil spill population estimates to determine population trends. We plan to use a homogeneity of slopes test (Freud and Littell 1981) to compare population trends between the oiled and unoiled zones of Prince William Sound to examine whether species with population estimates of >500 individuals have changed over time. To do this, we must assume that

marine bird and sea otter populations increase at the same rate in the oiled and unoiled zones of Prince William Sound. The $\log_{10}$ of each population estimate will be calculated after adding 0.5 to the estimate to prevent effects from using log 0. Significantly different slopes would indicate that population abundance of a species or species group changed at different rates. For species or species groups showing a significant difference in slopes, we will determine the rate of change in each zone by linear regression analyses.

To examine population trends from 1989-96 for the entire Sound, we will calculate linear regressions of the total population estimates of each species and species group.

To map species distribution, densities will be calculated from the number of sightings on transects. For shoreline transects, we will map the density per transect, but for the pelagic and coastal-pelagic strata, we will map the density by block.

5. Statistical Justification for Proposed Monitoring Schedule

Currently, these surveys are scheduled to occur every 3 years over an unspecified time period. This schedule needs to be reconsidered in light of the results of a power analysis.

To determine optimum survey frequency, we conducted a power analysis to estimate the probability of detecting trends in abundance using linear regression from a given number of samples (Gerrodette 1987). We examined our power to detect trends when coefficient of variation (CV) of the population was 0.28 (mean CV from July 1993 Prince William Sound survey) with a confidence level (α) of 0.10 (Fig. 2). Statistical tests commonly use a small α level ($\leq$0.05) to minimize probability of a Type I error. This reduces the probability of reporting a trend when none exists. However, power, the ability to detect a trend when it does exist, is inversely related to α. For example, if we raise the α level to $\leq$0.10, we increase our power to detect a trend by 5-13%. If a population may be declining, the benefits of increased power to detect a trend may outweigh the risks of lowering the confidence level. We also examined the power to detect trends for *Brachyramphus* murrelets (CV=0.13 in July), because they are an injured species (Fig. 3). Models of seabird population growth predict most species increase no more than 12% per year (Nur and Ainley 1992), so we used 10% for our comparisons.

With biannual surveys, power to detect an average annual change of 10% would be 31% over 10 years (5 surveys), 95% over 20 years (10 surveys), and nearly 100% over 30 years (15 surveys) (Table 1). If surveys are conducted every third year, power to detect the same 10% annual trend would be 21% over 10 years (4 surveys), 61% over 20 years (7 surveys), and 95% over 30 years (10 surveys). Biannual surveys conducted over 30 years would have 92% probability of detecting a trend when the average rate of change is only 5%, but surveys conducted every third year for the same time period would only have a 50% change of detecting such a trend.

Power is also affected by CV. For example, *Brachyramphus* murrelets, an injured species, had a CV of 0.13 (Table 2). With biannual surveys, power to detect an average annual change of 10% would be 80% over 10 years, 97% over 20 years, and nearly 100%

over 30 years. If surveys are conducted every third year, power to detect a 10% annual trend would be 56% over 10 years, 66% over 20 years, and 97% over 30 years. Thus, if we could decrease the CV, power would increase. This is unlikely to occur. We plan to keep the survey techniques and design the same to increase possibilities of examining individual transects over time (route regression analysis, Geissler and Sauer 1990, Sauer and Geissler 1990).

Based on these calculations, we recommend a monitoring schedule of every two years for these surveys. Surveys occurring only every third year have limited power to detect trends unless trends are extreme.

C. Contracts and Other Agency Assistance

This project includes two contracts for a vessel to provided logistical support. We will need a vessel large enough to provide lodging and meals for 9 people and carry fuel for the small boats. During the winter survey, we will need a vessel for 10 days, but in the summer we will only need one for 5 days and will camp or use existing field camps when necessary. During winter, we will coordinate our schedule with the winter sea duck surveys, Restoration Project 95025, Mechanisms of Impact and Potential Recovery of Nearshore Vertebrate Predators, so that we may use the same charter vessel on back-to-back survey. This will hopefully reduce the cost of the charter, if the owners know that they were applying for a longer contract.

D. Location

This study will be conducted in Prince William Sound. The study area includes all water within Prince William Sound, as well as land within 100 m of the shore.

SCHEDULE

A. Measurable Project Tasks for FY 96

October-December:	Arrange logistics for surveys
January:	Hire personnel
February:	Train personnel
March:	Conduct winter survey in Prince William Sound
April-May:	Return to Anchorage, enter data, and store equipment
June:	Hire personnel, arrange logistics for summer survey
July:	Conduct summer survey in Prince William Sound
August:	Return to Anchorage, enter data, and store equipment
September:	Analyze data from surveys

B. Project Milestones and Endpoints

We will examine the project objectives each season and will publish a report as explained below. After each set of surveys, we will examine the data for trends.

C. Project Reports

October:	Prepare draft report of 1996 surveys
November 30:	Draft Report to Oil Spill Coordinator
January 15:	Draft Report to Peer Review
April 30:	Final Report complete

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

This project will provide valuable information on the distribution and habitat use of marine birds and sea otters in Prince William Sound. We plan to coordinate our winter survey with the winter sea duck surveys, part of Restoration Project 95025, Mechanisms of Impact and Potential Recovery of Nearshore Vertebrate Predators. We will both need a support vessel to provide logistics and plan to arrange our survey schedules so that we can use the same vessel on back-to-back surveys to reduce the daily charter rate. This project is also being coordinated with other U.S. Fish and Wildlife Service and National Biological Service seabird monitoring studies in Prince William Sound and elsewhere (ie.- Lower Cook Inlet, Southeast Alaska). Survey data from this project will be available for use by investigators of other studies on marbled murrelets, black oystercatchers, pigeon guillemots, black-legged kittiwakes, forage fish, and sea otters.

This project is not a part of normal agency management for the U. S. Fish and Wildlife Service in Alaska. Although considered an important ecosystem within Alaska, surveys of Prince William Sound would not be as high a priority as funding for projects within other areas of the state.

This year, Migratory Bird Management, U. S. Fish and Wildlife Service plans to provide 4 permanent personnel during the March survey to help reduce costs, but such personnel are unavailable during the July survey, because they are involved in other projects.

ENVIRONMENTAL COMPLIANCE

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

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PERSONNEL

1. Project Leader - Beverly A. Agler, Wildlife Biologist, GS-11.

Beverly Agler received her M.S. degree in Wildlife Management from University of Maine, Orono in 1992 and her B.A. degree in Human Ecology from College of the Atlantic in 1981. She has worked for the U. S. Fish and Wildlife Service since May 1993 as a Wildlife Biologist. Ms. Agler has conducted 5 surveys in Prince William Sound, Lower Cook Inlet, and Southeast Alaska to determine abundance of marine birds and sea otters. Prior to her arrival in Alaska, she participated in a joint National Science Foundation, National Oceanographic and Aeronautics Administration, University of Washington, and College of the Atlantic study of Antarctic seabirds and marine mammals. For over 10 years, she was the Project Director of the North Atlantic Fin Whale Catalogue, based at College of the Atlantic in Bar Harbor, Maine. She coordinated a collaborative study of fin whales in the western North Atlantic, including coordinating photographic identification of individuals, and genetic differentiation of individuals using skin biopsies.

Selected Publications:

Agler, B. A., P. E. Seiser, S. J. Kendall, and D. B. Irons. 1994a. Marine bird and sea otter populations of Prince William Sound, Alaska: population trends following the *T/V Exxon Valdez* oil spill. Restoration Project No. 93045. Final Rep., U. S. Fish and Wildl. Serv., Anchorage, Alas. 51 pp. + appendices.

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2. Project Manager - David B. Irons, Ph.D, Wildlife Biologist, GS-12.

Dr. David Irons received his Ph.D from the University of California, Irvine in 1992. His dissertation was on the foraging ecology and breeding biology of the black-legged kittiwake in Prince William Sound. He 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. Dr. Irons conducted marine birds and sea otter surveys in Prince William Sound in 1984 and 1985. He has been studying kittiwakes in Prince William Sound for 11 years and completed the *Exxon Valdez* oil spill kittiwake damage assessment study. Dr. Irons has overseen several seabird studies in the past few years, including marine bird and sea otter surveys of Prince William Sound and Cook Inlet, a seabird monitoring study on Little Diomede Island, and a cost of reproduction study on kittiwakes.

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Table 1. Power (%) to detect trend when surveys (mean CV = 0.28) are conducted biannually compared with surveys occurring every three years for two different average annual rates of change (5 and 10%).

	Biannual			Every 3 Years		
		Rate of Change			Rate of Change	
Years	No. Surveys	5%	10%	No. Surveys	5%	10%
10 years	5	15	31	4	11	21
20 years	10	50	95	7	25	61
30 years	15	92	>99	10	50	95

Table 2. Power (%) to detect trend for *Brachyramphus* murrelets, an injured species (CV = 0.13), when surveys are conducted biannually compared with surveys occurring every three years for two different average annual rates of change (5 and 10%).

	Biannual		Every 3 Years	
Years	5%	10%	5%	10%
10 years	35	80	23	56
20 years	97	>99	66	>99
30 years	>99	>99	97	>99

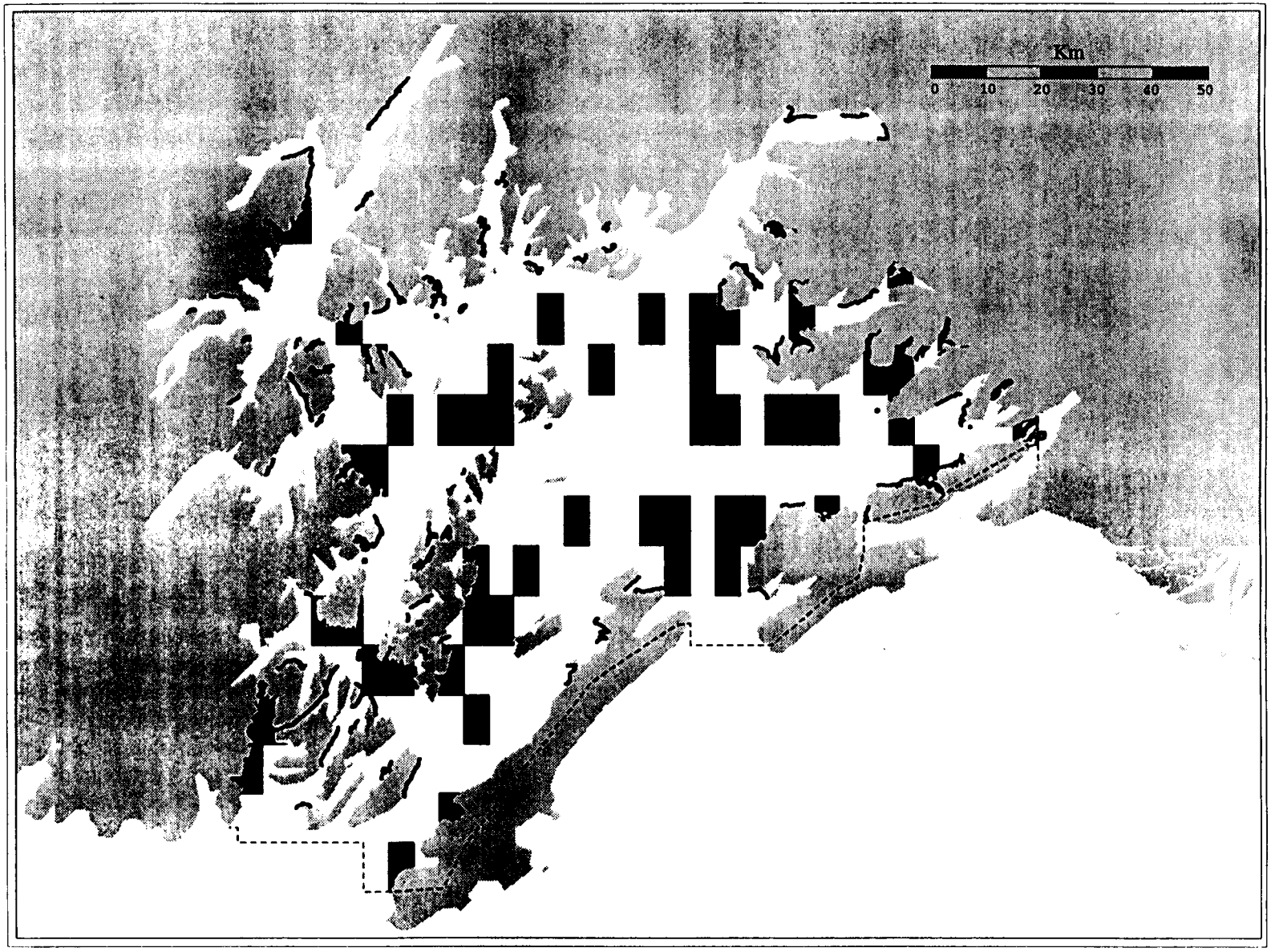

Figure 1. Transects and blocks surveyed during a small boat survey of Prince William Sound, March 1994. Transects were classified into 3 strata; the shoreline stratum, (<200 m from land), the coastal-pelagic stratum (lighter shaded blocks), and the pelagic stratum (darker shaded blocks). We surveyed 2 200-m wide north-south transect lines in each block.

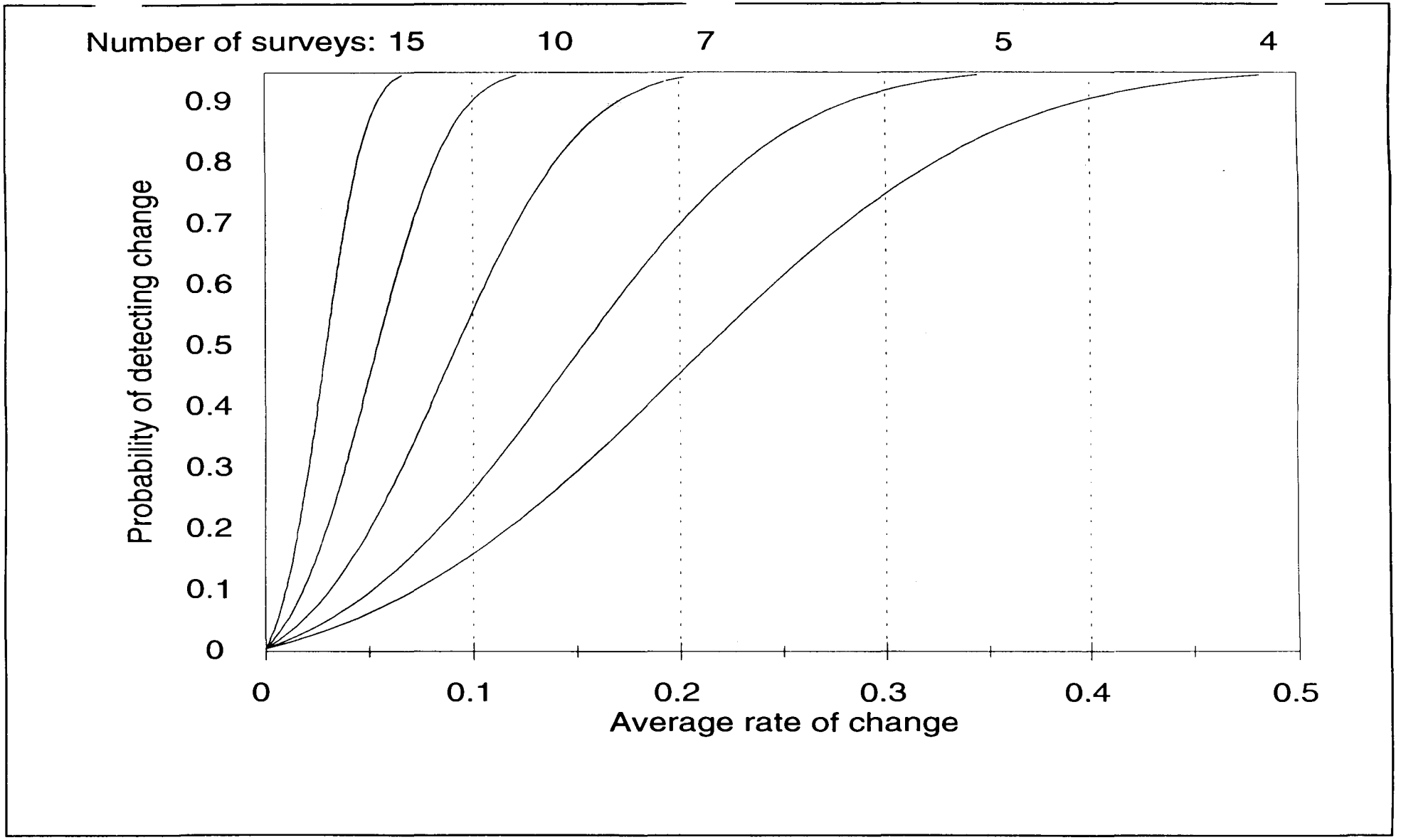

Figure 2. Estimated power (probability of detection) based on number of surveys conducted to detect a trend of marine bird and sea otter populations in Prince William Sound when CV = 0.28 (mean CV from July 1993 surveys) and confidence level of 0.10.

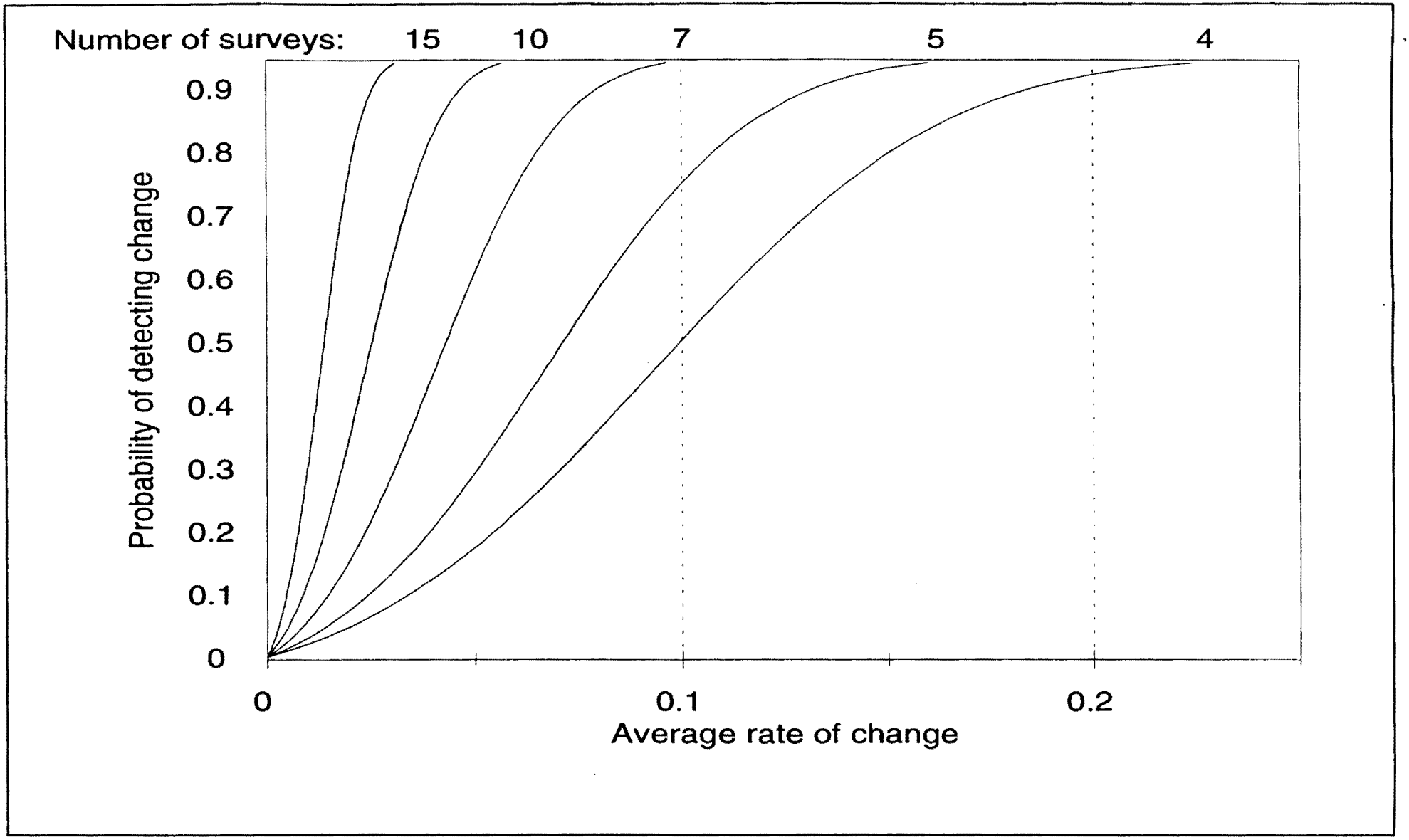

Figure 3. Estimated power (probability of detection) based on number of surveys conducted to detect a trend for *Brachyramphus* murrelet populations in Prince William Sound when CV = 0.13 (CV from July 1993 surveys) and confidence level of 0.10.

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996						
Personnel	$0.0	$142.3						
Travel	$0.0	$13.6						
Contractual	$0.0	$45.1						
Commodities	$0.0	$35.9						
Equipment	$0.0	$1.5	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$0.0	$238.4	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration		$24.5						
Project Total	$0.0	$262.9	$25.0	$260.0	$25.0	$260.0	$25.0	$260.0
Full-time Equivalents (FTE)		3.4						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

1996

Project Number: 96159
Project Title: Marine Bird Boat Surveys
Agency: DOI - Fish and Wildlife Service

FORM 3A
AGENCY
PROJECT
DETAIL

Prepared

5/1/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	Proposed FFY 1996
PM	Name	Position Description					
	Agler	Project Leader	GS11 - 2/3	12.0	4,429	3,231	56.4
	Kendall	Assistant Project Leader/GIS Person	GS9 - 3/4	8.0	3,851	3,227	34.0
	Unknown	Technician	GS5 - 1	4.0	1,595	1,935	8.3
	Unknown	Technician	GS5 - 1	4.0	1,595	1,935	8.3
	Unknown	Technician	GS5 - 1	3.0	1,595	1,935	6.7
	Unknown	Technician	GS5 - 1	2.0	1,595	1,075	4.3
	Unknown	Technician	GS5 - 1	2.0	1,595	1,075	4.3
	Unknown	Technician	GS5 - 1	2.0	1,595	1,075	4.3
	Unknown	Technician	GS5 - 1	2.0	1,595	1,075	4.3
*	Irons	Program Manager	GS12 - 4	2.0	5,718	0	11.4
							0.0
							0.0
		Subtotal		41.0	25,163	16,563	
Those costs associated with program management should be indicated by placement of an *.						**Personnel Total**	$142.3

Travel Costs:		Ticket Price	Round Trips	Total Days	Daily Per Diem	Proposed FFY 1996
PM	Description					
	Truck and boat on train Portage - Whittier	714	6			4.3
	Passengers on train, Portage - Whittier (winter)	10	6			0.1
	Passengers on train, Portage - Whittier (summer)	16	13			0.2
	Per diem, (camp rate), 9 people, 30 days each survey			540	3	1.6
	Per diem, (travel rate), 9 people, 2 days winter, 7 days summer, 7 people, 3 days training			102	48	4.9
	Lodging, 9 people, 4 nights (Valdez)			36	35	1.3
	Lodging, 5 nights, room @ $90/night total (Cordova)			5	90	0.5
	Lodging, 7 people, 3 nights, (Whitttier during boat training)			21	35	0.7
						0.0
						0.0
						0.0
						0.0
Those costs associated with program management should be indicated by placement of an *.					**Travel Total**	$13.6

1996

Project Number: 96159
Project Title: Marine Bird Boat Surveys
Agency: DOI - Fish and Wildlife Service

FORM 3B
Personnel
& Travel
DETAIL

1996 EXXON VALDEZ TRUST COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:	Proposed
Description	FFY 1996
Charter vessel (winter), 10 days	20.0
Charter vessel (summer), 5 days	10.0
Harbor fees	0.5
Boat repairs and parts	12.0
Training - First Aid/CPR	1.4
Computer, printer, network repair and maintenance	0.5
Telephone services in office and field	0.7
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$45.1

Commodities Costs:	Proposed
Description	FFY 1996
Boat fuel (100 gal/day/boat) 3 boats for 50 days @ $1.50/gal	22.5
Outboard oil (2 gal/day/boat) 3 boats for 50 days @ $12.00/gal	3.6
Food ($10.00/person/day) 9 people for 50 days	4.0
Rain gear, rubber boots and gloves for 9 people @ $200/person	1.8
Scientific supplies (batteries for radios & other equipment, waterproof notebooks & paper, thermometers, wind guages)	1.2
Office supplies (computer diskettes, paper, pencils, pens)	0.2
Software updates for computers	0.4
First Aid kits	0.2
Lines, anchors and propellers for boats	1.5
Duplication costs	0.4
Cleaning supplies	0.1
Commodities Total	$35.9

1996

Project Number:
Project Title: Marine Bird Boat Surveys
Agency: DOI - Fish and Wildlife Service

FORM 3B
Contractual & Commodities DETAIL

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FFY 1996
Emergency replacement of equipment			1.5
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$1.5

Existing Equipment Usage: Description	Number of Units	Inventory Agency
Camping supplies		DOI -FWS
Survival suits	9	DOI -FWS
Mustang suits	9	DOI -FWS
Float coats	9	DOI -FWS

1996

Project Number:
Project Title: Marine Bird Boat Surveys
Agency: DOI - Fish and Wildlife Service

FORM 3B
Equipment
DETAIL

96160

Assessment of Recovery from Surface Oiling, Subsurface Oiling, and Subsurface Invertebrate Contamination by Oil on Gulf of Alaska Shorelines Affected by the *Exxon Valdez* Oil Spill

Project number:	~~96256~~ 96160
Project type:	Research and monitoring
Project leaders:	Dr. Gail Irvine, NBS; Dr. Daniel Mann, UAF
Lead Agency:	NBS
Cooperating Agencies:	NOAA (1997 and beyond)
Duration:	6 years (5 years field work, and HC analyses and closeout)
Cost FY 96:	$129.7
Cost FY 97:	$130
Cost FY 98:	$135
Cost FY 99:	$135
Cost FY 00:	$145
Cost FY 01:	$100
Geographic area:	Outer Kenai Peninsula, Katmai coastline of Shelikof Strait
Injured Resource/Service:	Sediment; invertebrates; scientific, recreational values (including wilderness characteristic) of national park, and national refuge coastlines, as well as state lands.

ABSTRACT

Oil on the surface of Gulf of Alaska shorelines has disappeared relatively rapidly. However, poorly-known and perhaps substantial amounts of subsurface oil persist. We plan to assess and monitor surface and subsurface oil at 12 and 10 sites, respectively. We will document subsurface oil through excavations and monitor its weathering using an innovative system of collection wells. Amphipods, widespread invertebrates living within the beach substrate, will be monitored for tissue contamination by buried hydrocarbons.

INTRODUCTION

The *Exxon Valdez* oil spill (EVOS) directly affected scientific and recreational values including the wilderness characteristics of shorelines in Kenai Fjords National Park, Katmai National Park and Preserve, and Aniakchak National Preserve and Monument. These injured values and characteristics continue to be injured by the persistence of oil that degrades the "naturalness" of the coasts. These values and characteristics are clearly stated in both ANILCA (1980) and the Wilderness Act (1964). Injury to Kenai Fjords and Katmai National Parks and adjacent areas is addressed in this proposal.

In general, the shorelines impacted by *Exxon Valdez* oil in the Gulf of Alaska (GOA) region experience higher wave energy than those inside Prince William Sound (Hayes et al. 1977; Hayes and Ruby 1979; Domeracki et al. 1981; Hates 1986). Gravel beaches, those composed of mixtures of sand, pebbles, cobbles and boulders, are the most common type of non-bedrock shorelines in the GOA region (Hayes et al. 1976). Gravel beaches exposed to moderate and high wave energies characteristically develop a lag of boulders (stones > 25 cm in diameter) after smaller stones are winnowed away by waves. This boulder lag forms an "armor" that shields the gravel substrate from wave disturbance. Unaffected by all but the largest storm waves, the gravel substrate under a boulder armor can remain undisturbed for years. Observations in the study plots we have established to monitor the persistence of surface oil in Kenai Fjords and Katmai National Park suggest that on 5 of 6 boulder-armored beaches, no shifting of the boulder armor occurred over the last 6 years (Mann et al. 1995).

It is thought that how long spilled oil remains on a shoreline depends on the vigor of wave action (Vandermuelen 1977; Gundlach 1983). Frequent large waves breaking on a beach cause vigorous natural cleaning and consequently a short residence time for stranded oil. However, the *Exxon Valdez* spill affected many gravel beaches, many possessing the boulder armoring just described. While high wave energy does seem to limit the persistence of surficial oil on gravel beaches, it may have little effect on the persistence of subsurface oil. Subsurface oil can persist even within high wave-energy gravel beaches because the boulder armor prevents waves from stirring the beach substrate.

The amount of subsurface oil persisting on Gulf of Alaska shorelines has never been fully assessed. Exxon Corporation ran several studies whose results have never been publicized. Results of our several-year study of surface-oil fate and persistence on beaches in Kenai Fjords and Katmai National Parks indicate sizable reductions in the amount of surficial oiling there. However, observations made last summer suggest that significant amounts of subsurface oil remain within gravel beaches along the Katmai coast of Shelikof Strait, even after these beaches are clean at the surface. Similar inferences emerge from the studies of Michel and Hays (1993a, 1993b, 1994) on the fate of shore-stranded oil on Prince William Sound shorelines. We suspect that buried oil mousse is common on boulder-armored gravel beaches where heavy surficial oiling was observed after the oil spill. We request funds to continue our monitoring of surface oil in the GOA region and to begin an in-depth examination of the extent and persistence of subsurface oil in gravel beaches there. To assess the potential impacts of this subsurface oil on the biota, we will collect marine amphipods

(beach hoppers), ubiquitous invertebrate residents of upper shorefaces, and analyze their tissues for hydrocarbon contamination.

NEED FOR THE PROJECT

A. Statement of the Problem

This proposal concerns the assessment of injury to scientific, recreational, and wilderness values on Gulf of Alaska coastlines that occurred through the oiling of shoreline sediments. At the same time, our proposed study aims to document the recovery of oiled sediments through natural processes of physical and chemical weathering of petroleum products.

Shoreline sediments were impacted by *Exxon Valdez* oil in an obvious way by oil stranded on the surface. However, the amount of oil seeping into or being buried in the substrate of beaches was never adequately assessed, especially on remote beaches in the Gulf of Alaska. Gravel beaches are widespread in the GOA region and most have an armor of lag boulders that prevents natural cleaning of subsurface oil. Boulder-armored gravel beaches potentially comprise a widespread problem spot for subsurface oil persistence. How much subsurface oil remains? What is its chemical weathering state? How fast is it disappearing through mechanical and chemical weathering? Is subsurface oil interfering with the recovery of beach invertebrates?

B. Rationale

The project we propose will document damage to oiled sediments and to invertebrate populations living in the substrate of gravel beaches. The five-year monitoring plan we propose will continue observations of surface-oil weathering at six sites already established in the GOA. It will also initiate the monitoring of subsurface oiling at six new sites where we will first assay the amount and type of subsurface oiling and then monitor its chemical weathering over subsequent years. Our results will help describe the progress of recovery of oiled sediments and certain invertebrate organisms living within them. Results will guide decisions about whether further restoration efforts are desirable and how they might be implemented. Our results will also help predict the effects of future oil spills in this region and guide future oil-spill response efforts.

C. Summary of Major Hypotheses and Objectives

1. Continued monitoring of the fate of stranded surface oil on GOA shorelines indicates gradual disappearance of this oil. We hypothesize that surficial oil will disappear entirely over the next five years.

2. Preliminary observations lead us to hypothesize that a certain type of shoreline widespread in the Gulf of Alaska region, boulder-armored gravel beaches, can act as a long-term storage site for subsurface oil contamination. We will test this hypothesis

by examining ten boulder-armored, gravel beaches known to have received heavy surface oiling in 1989.

3. From observations at surface-oil monitoring sites in the GOA region, we hypothesize that storms capable of shifting boulder armor and stirring the gravel substrate are infrequent (less than one per decade). Because the substrate of these beaches remain undisturbed, little weathering of buried oil occurs. We will test this hypothesis by documenting occasions when armoring boulders are moved by storm waves within our permanent plots.

4. We hypothesize that oil trapped in the subsurface of boulder-armored gravel beaches will remain there for lengthly intervals since it is shielded from both physical abrasion and evaporation. We aim to monitor the persistence and chemical weathering of buried oil by maintaining a series of sampling wells buried in the shoreface. Water samples from these wells will be retreived and analyzed for hydrocarbon content on an annual basis.

5. We hypothesize that the oil buried in boulder-armored gravel beaches contaminates organisms living in the adjacent substrate. We will test this hypothesis by trapping amphipods, small omnivorous invertebrates living withing the gravel substrate, and assaying their tissues for hydrocarbon contamination.

D. Completion Date

Work will be completed during the fiscal year 2001. We need five years to gain the observational data base necessary to document the expected complete disappearance of surficial oiling and the predicted persistence of slightly weathered oil buried in the substrate at our permanent monitoring sites. Because we expect hydrocarbon samples to have high variance and are concerned about getting enough samples, we propose annual visits. We expect to see complete natural restoration of surface-oiled sediments but only slow and partial recovery of subsurface-oiled sediments and associated invertebrates. funding in 2001 will cover hydrocarbon analyses of the previous year's samples, removal of collecting tubes from the field, and closeout.

COMMUNITY INVOLVEMENT

No community involvement is anticipated for this project as no communities exist in the vicinities of these sites. The public will be represented by the PAG and other public processes set by the Trustee Council.

FY 96 BUDGET

Personnel:	23.5
Travel:	2.2

Contractual:	93.0
Commodities	1.0
Equipment:	0.0
Subtotal:	119.7
General Administration:	10.0
Total	$129.7

Note: A budget for hydrocarbon analyses will be included in the 1997 budget. Analyses are expected to be done by Auke Bay Laboratories for continuity and they have informed us that any 1996 samples will not be analyzed until 1997. Consequently, all hydrocarbon analysis budgets will occur in the year following sampling.

PROJECT DESIGN

A. Objectives

1. Continue the monitoring of surface-oil weathering at six permanent sites already established in the Gulf of Alaska (GOA) region. Our goal is to document the expected continued recovery of surface-oiled sediments.

2. Visit and assess subsurface oiling at 10, boulder-armored gravel beaches in the GOA region where heavy surface oiling was reported in 1989.

   A. Choose six new monitoring sites on boulder-armored gravel beaches which had heavy surface oil in 1989. At these sites, establish monitoring sites to track both surface- and subsurface-oil fate and persistence over a five year period.

   B. Four of the previously-established surface-oil monitoring sites will be expanded to monitor subsurface oil as well.

3. At the subsurface monitoring sites, first assess the amount and chemical composition of buried oil. Next, install a network of semi-permanent sampling wells in the beach face. These will be revisited, uncapped, and sampled during visits in subsequent years.

4. At the subsurface monitoring sites, collect subsurface-dwelling amphipods from the vicinity of buried oil deposits. Tissues of these animals will be assessed for hydrocarbon contamination.

B. Methods

Objective #1: Continued monitoring of the fate of stranded surface oil on GOA shorelines will be accomplished by methodologies established in 1994. Namely, oil percent cover will be estimated visually in the field within 10-25 quadrats marked by rock bolts. The amount of geomorphological disturbance on these beaches will be assessed by resurveying the altitudes and positions of bolted boulders.

Objective #2: To test the hypothesis that boulder-armored gravel beaches act as long-term storage sites for subsurface oil contamination, we will examine ten boulder-armored, gravel beaches known from Exxon SCAT, National Park Service, and Alaska Department of Environmental Conservation reports to have received heavy surface oiling in 1989. At each of these sites, a sampling grid will be laid out and excavations made at regular intervals, probably in the center of every 5 m^2 area. Excavations will be made by pick, shovel, and pry bar, using a come-along to move large boulders. One of us (D.H.M.) spent several weeks doing this same work for Exxon Corporation so we are well-acquainted with its challenges. Two field assistants will aid in this work. Pits will be dug to waterline during low spring tides. Profiles will be described by standard soil-science procedures (Soil Survey Staff 1993). Previous work has shown that buried terrestrial soils are often present and are important in oil retention. Sketches of buried oil distribution will be made (cf., Michel and Hays 1994). The volume of buried oil in the excavated material will be roughly estimated.

Objective #3: From observations at surface-oil monitoring sites in the GOA region, we hypothesize that storms capable of shifting boulder armor and stirring the gravel substrate are infrequent (less than one per decade). We will test this hypothesis by tracking the positions of armoring boulders over the five year span of the study. At each site (both surface and subsurface monitoring sites) ten to twenty different armoring boulders will be tagged with rock bolts. The altitudes and horizontal positions of these boulders will be recorded to ± 2 cm. Resurveys of bolt positions in succeeding years will provide an accurate record of changes in the configuration of the boulder armor.

Objective #4: We aim to monitor the persistence and chemical weathering of buried oil by maintaining a series of sampling wells buried in the shoreface. Wells will consist of 0.5-1.5 m segments of stiff teflon tubing, 2.5 to 6 cm in diameter, open at their lower ends, inserted vertically in the excavations opened in 1996 to describe subsurface oil. Perforations in the tubing walls will allow free circulation of water in and out of these wells during tidal cycles. Wells will be capped with teflon screw caps. Well tops will be buried flush with the beach surface and protected with boulders from wave damage. On an annual basis, we will sample water from each well using a commercially available, hazardous-waste sampling pump. These water samples will be analyzed (GC/MS) for their hydrocarbon contents at the Auke Bay Laboratory (in 1997). Two control wells will be placed in nearby areas of the study beaches where no subsurface oil is detectable. We will test for the statistical significance of changes in hydrocarbon concentrations in well samples using standard regession analysis of both single well data versus sampling year and pooled samples of all wells versus sampling year. Changes in the hydrocarbon components detectable in the well samples should also document the rate and progress of weathering in the subsurface oil.

Objective #5: To test if oil buried in boulder-armored gravel beaches contaminates organisms living in the adjacent substrate, we will trap gammaridean amphipods (subphylum Crustacea, order Amphipoda) that live in the beach substrate and assay their tissues for hydrocarbon content. These organisms occur in large numbers throughout southern, coastal Alaska and their use in this study in no way endangers even their local abundance. Control samples will be taken from nearby beaches with no buried oil. Gammaridean amphipods of several species inhabit the interstitial spaces within the upper intertidal zone of gravel beaches.

They are omnivorous, feeding on dead plants and animals, and have been shown to be sensitive to hydrocarbon levels following spills (Cabioch et al. 1980; Teal and Howarth 1984; Elmgren et al. 1980; Sanders et al. 1980). We are still designing a trap capable of trapping amphipods below the surface. This trap will probably be similar to a fine-wire mesh minnow trap with a one-way entrance, baited and buried beneath the surface adjacent to deposits of buried oil. The traps will be retrieved within a week of setting. We estimate that ten traps per site will yield approximately 50-100 amphipods. The captured amphipods will be pooled then frozen and their whole-ground tissues assayed for hydrocarbon content. Pooling of the traps will probably be necessary in order to obtain sufficient tissue for analysis.

C. Contracts and Other Agency Assistance

Contracts will be needed to acquire the services of Dr. Dan Mann (plus some field assistant time). Contracts through the NBS Research Unit at the University of Alaska Fairbanks will be used. Additional contracts will be needed for field support (vessel, fixed-wing aircraft). Federal contracting procedures will be followed. We expect hydrocarbon and tissue samples to be analyzed by NOAA's Auke Bay Laboratories in 1997 and beyond.

D. Location

The project will be undertaken along the outer coast of the Kenai Peninsula and on the Shelikof Strait coastline of the Alaska Peninsula on state of Alaska Lands in the intertidal zone. Specific study locations include: Morning Cove (Pye Islands), Pony Cove (Aialik Peninsula), Tonsina Bay, Windy Bay, Chugach Bay, Cape Douglas, Kiukpalik Island, Ninagiak Island, Cape Gull, and Kashvik.

SCHEDULE

A. Measurable Project Tasks for FY 96

Start-up to February 1:	Selection of potential sites from Exxon, ADEC, and National Park Service documents.
February 1 to April 1:	Arrange charter boat contract, recruit field personnel, design amphipod traps after a thorough search of the biology literature on research techniques on similar species.
April 1 to May 1:	Construct subsurface-sampling wells, construct amphipod traps, assemble surveying equipment, purchase digging equipment and food supplies.
May 1 to June 30:	Field work, starting in eastern Kenai Fjords and working westward to the Katmai coast. The last 5 days will be involved in revisiting each site to collect the amphipod taps and to check the condition of the wells.
August 1 to September 30:	Analysis of field data
April 1997:	Annual report on FY 96 work

B. Project Milestones and Endpoints

Objective #1: Monitoring of surface-oil weathering at six permanent sites already established in the Gulf of Alaska region. Our goal is to document the expected continued recovery of surface-oiled sediments. This goal will be acheived after 5 more years of monitoring, in 2001.

Objective #2: Initial assessment of 10, boulder-armored gravel beaches in the GOA region where heavy surface oiling was reported in 1989 will be completed during the first field season of this project. Results will be reported in the spring of 1997. These results test our hypothesis that subsurface oil persists on this widespread type of shoreline in the GOA region. Establishment of subsurface-oil monitoring sites will follow completion of this objective.

Objective #3: During the first field season, May of 1996, monitoring sites for subsurface oil persistence will be established on six boulder-armored gravel beaches that had heavy surface oil in 1989. Also during May of 1996, four of the six previously-established surface-oil monitoring sites will be expanded to monitor subsurface oil.

Objective #4: At the subsurface monitoring sites, the amount and chemical composition of buried oil will be described through extensive test-pit excavations in 1996. These results will be reported in the report submitted to the EVOS Trustees in April, 1997. A network of semi-permanent sampling wells will be established at each site concurrently with pit excavations in May of 1996. On an annual basis for five years, these sites will be revisited and water samples collected. Results of hydrocarbon analyses will be reported annually.

Objective #5: At the subsurface monitoring sites, subsurface-dwelling amphipods will be collected from the vicinity of buried oil deposits. Tissues of these animals will be assessed for hydrocarbon contamination. These activities will be carried out annually and reported in each annual report.

Project conclusion: In May of 2001, we will revisit all the monitoring sites and carefully remove all materials placed there by our project. We will submit a final report to the EVOS Trustees in April, 2002, that will include as appendicies copies of all scientific publications produced during this project.

C. Project Reports

We feel that annual reports to the EVOS Trustees serve a useful organizational purpose within our project, even though they may be partially duplicated by the publication of scientific articles. We plan on submitting these reports by April 1 for each year of this project. As stated above, we will submit a final report in April 2002.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Co-ordination will be maintained with ADEC to facilitate the flow of information and decision-making about potential future restoration activities. Information will be shared with the NPS and other upland land managers. Coordination will also occur with NOAA's Auke Bay Laboratory and Dr. Jeffrey Short, who was included in the FY 94 budget and who will be included again in 1997. Hydrocarbon analyses are expected to be done by the ABL. Samples from 1992 were analyzed by them and 1994 samples are awaiting analysis. Jeff will be providing interpretation of the analytical HC results.

ENVIRONMENTAL COMPLIANCE

Field sampling of oiled intertidal areas is essentially a non-obtrusive 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 EIS or EA.

This project is not part of normal agency management. Although initiated by the NPS, the project has transferred to the NBS due to its research focus.

PERSONNEL

Daniel H. Mann received his Ph.D. in soils from the University of Washington in 1983. His MS degree was awarded from the University of Washington in 1978 in entomology. For the last 20 years, Dr. Mann has studied Quaternary geology in Alaska including major projects on sea-level change, coastal geomorphology, glaciation history, soil genesis, paleoseismicity, and paleoecology. He worked as a coastal geologist for Exxon Corporation during the EVOS response, primarily on the outer coast of the Kenai Peninsula where he monitored stranded surface oil and surveyed subsurface oiling. Dr. Mann joined Dr. Irvine's study of stranded surface oil on the Kenai and Katmai coastline in 1994.

Gail V. Irvine received her doctoral degree in Biology from the University of California at Santa Barbara in 1983, with an emphasis in Aquatic and Population Biology. She has a M.S. degree from the University of Washington in Zoology, and a B.A. (with honors) from the University of California, Santa Barbara. After receiving her Ph.D., Gail worked with the Minerals Management Service in Alaska, doing broad-scale analysis of effects of oil and gas activities on marine and coastal ecosystem, projecting likely effects of oil spills on pelagic, benthis and coastal biological communities. She was a technical reviewer on a multi-year oil spill project conducted by the Smithsonian Tropical Research Institute in Panama. since joining the National Park Service in 1990, she has been involved in conducting research on intertidal ecology and has been supervising the Oiled Mussel, Gulf of Alaska study and the 1992 and 1994 predecessors to this proposal. Her position at the NPS has recently been transferred to the new National Biological Service.

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Date Prepared

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1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996						
Personnel	$26.9	$23.5						
Travel	$3.9	$2.2						
Contractual	$25.0	$93.0						
Commodities	$4.0	$1.0						
Equipment	$0.0	$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$59.8	$119.7	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration	$5.8	$10.0						
Project Total	$65.6	$129.7	$130.0	$135.0	$135.0	$145.0	$100.0	$0.0
Full-time Equivalents (FTE)	0.5	0.3						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

1996

Prepared:

Project Number: 96266
Project Title: Assessment of Recovery from Surface Oiling, Subsurface Oiling, and Subsurface Invertebrate Contamination by Oil on Gulf of Alaska Shorelines Affected by the *Exxon Valdez* Oil Spill
Agency: National Biological Service

FORM 3A
AGENCY
PROJECT
DETAIL

5/1/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
	Gail V. Irvine	Marine Ecologist	GS/12/7	3.0	6,200		18.6
	Leslie Holland-Bartels	Program Manager		0.5	7,000		3.5
		Secretarial		0.5	2,800		1.4
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		4.0	16,000	0	
Those costs associated with program management should be indicated by placement of an *.						**Personnel Total**	$23.5

Travel Costs:		Ticket	Round	Total	Daily	Proposed
PM	Description	Price	Trips	Days	Per Diem	FFY 1996
	Anch/Homer /Anch	180	2	2	131	0.6
	Anch/LaPaz,Mex/Anch (Present findings at Western Society of Naturalists	950	1	6	111	1.6
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
Those costs associated with program management should be indicated by placement of an *.					**Travel Total**	$2.2

1996

Project Number: 96266
Project Title: Assessment of Recovery from Surface Oiling, Subsurface Oiling, and Subsurface Contamination by Oil on Gulf of Alaska Shorelines Affected by the *Exxon Valdez* Oil Spill
Agency: National Biological Service

FORM 3B
Personnel
& Travel
DETAIL
/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

Contractual Costs:	Proposed
Description	FFY 1996
Univ. of Alaska-Fairbanks Research Work Order Overhead - 10% Total Direct Costs	3.8
Salaries	25.4
Travel	7.5
Contractual	0.0
Commodities	5.5
Equipment	0.0
Boat lease, 2k/day x 38 days	76.0
Aircraft Charter, 8 hrs x $500/hr	4.0
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$93.0

Commodities Costs:	Proposed
Description	FFY 1996
Film, processing, shipping of samples, I-Chem jars, misc. office and field supplies, equipment maintenance	1.0
Commodities Total	$1.0

1996

Project Number: 96266
Project Title: Assessment of Recovery from Surface Oiling, Subsurface Oiling, and Subsurface Invertebrate Contamination by Oil on Gulf of Alaska Shorelines Affected by the *Exxon Valdez* Oil Spill
Agency: National Biological Service

FORM 3B
Contractual & Commodities DETAIL

5/1/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	Inventory Agency
Laptop computer, 486 min	1	

1996

Project Number: 96266
Project Title: Assessment of Recovery from Surface Oiling, Subsurface Oiling, and Subsurface Invertebrate Contamination by Oil on Gulf of Alaska Shorelines Affected by the *Exxon Valdez* Oil Spill
Agency: National Biological Service

FORM 3B
Equipment
DETAIL

5/1/95

825-95 revision

Pilot Study Harlequin Duck Population Interchange in Oil Spill Affected Areas of the Alaska Peninsula and Kodiak Archipelago Determined by Satellite Telemetry

Project Number:	96161
Restoration Category:	Monitoring
Proposer:	B. L. Goatcher, Coastal Management Biologist Katmai National Park and Preserve, Kodiak Coastal Unit Office 202 Center Avenue, #204, Kodiak, Alaska 99615-6312 907/486-6730 Phone; 907/486-3331 Fax
LeadTrustee Agency:	DOI-NPS
Cooperators:	DOI-FWS & DOI-NPS
Duration:	3 years
Cost FY 96: Cost FY 97: Cost FY 98:	$ 98,000 $167,500 $167,500
Geographic Area:	Alaska Peninsula, Kodiak Archipelago *Exxon Valdez* Oil Spill Regions
Injured Resource:	Harlequin duck, Nearshore ecosystem, Intertidal ecosystem, Recreation/Tourism & Designated Wilderness Area

ABSTRACT

The harlequin duck is an important ecological indicator in intertidal systems affected by the *Exxon Valdez* oil spill. This proposal will address the hypotheses that harlequin duck population distribution and abundance, and productivity have been impacted in oiled areas of the Gulf of Alaska. Population interchange among all oiled areas is possible, therefore information gained will serve to validate past and current research and monitoring in Prince William Sound.

INTRODUCTION

The harlequin duck (*Histrionicus histrionicus*) has been identified by the Trustee Council as an injured resource not recovering from the *Exxon Valdez* Oil Spill (EVOS). A major limitation to measuring recovery is the lack of comparable data from areas adjacent to Prince William Sound (PWS). Interchange of harlequin ducks among breeding populations of the Gulf of Alaska and its effect on the numbers of harlequin ducks in PWS is not known. Previous banding reports by Clarkson and Goudie (1994), Genter and Reichel (1994) and Cassirer and Groves (1994), have recounted the recovery of banded harlequins over large distances (e.g., respectively, Montana to Hornby Island, B. C. and Montana to Vancouver Island, B. C. and Idaho to coastal Washington and British Columbia). Katmai National Park (KATM) is the principle major oiled area in the affected region adjacent to PWS. Kodiak National Wildlife Refuge (KNWR) was also oiled substantially by the *Exxon Valdez* spill.

The recovery of harlequin ducks in these EVOS oil affected regions of the Gulf of Alaska (GOA) has not been determined. Harlequin ducks from the Gulf spill areas may use PWS as a wintering ground, thereby prolonging exposure to contaminants there as well as in a few pockets of heavy oil remaining in the Gulf regions. Pockets of EVOS crude persist below many beaches of the proposed study sites on KATM and KNWR.

Population information for areas outside PWS in the spill affected area is generally poor and based on single site surveys with little or no replication. At KATM 1,646 harlequin ducks were counted over 100 km of selected shorelines in 1994 (Goatcher 1994). Data calculations from National Biological Service (S. Kendall, unpubl. data) 1993 surveys estimate 2,436 harlequin ducks used the Kamishak Bay area adjacent to and including KATM habitats. Kodiak National Wildlife Refuge reported a minimum May 1994 population of 4,369 harlequin ducks from approximately 950 km of coastline adjacent to the Shelikof Straits (Zwiefelhofer 1994).. Given the size of the harlequin duck populations found in these two coastal areas and the change in population of harlequin ducks in Prince William Sound (PWS) between summer and winter, it is indicative of the possible influence and interchange with harlequin ducks in PWS.

In this project (Year 1) satellite transmitters will be surgically implanted in a sample of harlequin ducks from selected coastal areas of KATM and KNWR to determine whether population interchange between GOA and PWS may occur.

NEED FOR THE PROJECT

A. Statement of Problem

The current knowledge of the harlequin duck populations in Prince William Sound (PWS) and how these populations relate to other harlequin ducks in the Gulf of Alaska is uncertain. The most obvious deficiency in recovery of western PWS harlequin ducks is the lack of observed broods since the 1989 Exxon oil spill. However, observed spring populations of male harlequins in western PWS during 1994 and 1995 contained a minimum of 15-25% juvenile

and subadults (Rosenberg pers.comm.). The presence of immature males would suggest either broods are being hatched in western PWS and not being detected or the immature males are emigrating into western PWS from other harlequin duck populations. Determination of the origin of these juvenile and subadult males would seem to be of paramount importance in monitoring the recovery of western PWS harlequin ducks productivity. However, if these young males originate from other breeding populations their presence in western PWS and consequent exposure to the persistent hydrocarbons still present there would indicate oil impacts are continuing to be introduced to other Gulf of Alaska harlequin duck populations by this interchange.

Most of the contaminated beaches of the region were only superficially treated and sequestered oil continues to pollute intertidal and nearshore ecosystems. Harlequin ducks collected from the Kodiak area had elevated petroleum hydrocarbon levels equal to those from PWS (Patten 1994). The mean density of harlequin ducks wintering in Kodiak NWR bays adjacent to Shelikof Straits decreased significantly ($p = 0.031$) from the previous 10 years after EVOS (Zwiefelhofer 1994a).

All the oiled coast of KATM shores within the spill area are U. S. Congressional designated Wilderness Areas. Kenai Fjords National Park, as well as over 70% of Kodiak National Wildlife Refuge are also in the process for Wilderness designation. Progress in the restoration of Wilderness features has been negligible in these spill areas. With change in public perception of the injury to Wilderness (*Exxon Valdez* Trustee Council 1994) as a barometer of recovery, the KATM coast is unfortunately still perceived by the public as contaminated. Frome (1995) writes of Katmai in his popular Guide to National Parks in the U. S. and Canada, " If you visit beaches in the park, you may see signs of oil from the tanker *Exxon Valdez* , . . ."

B. Rationale

As a nearshore marine and freshwater benthos predator the harlequin duck is an ideal sentinel of ecosystem health. This species value as a sentinel or indicator for the purposes of this proposal are: (1) occurrence in all bio-regions of the spill affected area; (2) represents both nearshore/intertidal marine and freshwater ecosystem guilds; (3) foraging strategies promote the uptake of contaminants; (4) strong annual site fidelity for breeding, nesting and molting; (5) sensitivity to changes in the environment, particularly oil pollution and human disturbances; and (6) great distances can be covered in seasonal shifts in geographic location.

This proposal cannot remedy losses to Wilderness values on these coasts. But it can initiate a compensatory remediation process for recovery of Wilderness features, particularly for a high profile species representative of Wilderness like the harlequin duck. The data obtained by this study can begin the lengthy process of public education and perception modification in our handling of oil spill restoration in Wilderness Areas.

Information gained will be useful for comparison to Prince William Sound studies by establishing the extent of seasonal interchange in Gulf of Alaska and PWS harlequin duck populations (Rosenberg, pers. comm.).

Immediate establishment of annual population movements in the spill areas is important to comprehensive understanding and validation of the information collected by the two on-going harlequin duck studies (025 & 427) in PWS. Wilderness values will be perceived to be in recovery once progress has been detected in select sentinel species, such as harlequin ducks.

C. Summary of Major Hypothesis and Objectives

Objectives are in general to determine if satellite transmitters can be used to detect seasonal population interchange between Gulf of Alaska and Prince William Sound harlequin duck populations.

D. Completion Date

The restoration objectives of this project will be completed by the end of FY 1998.

COMMUNITY INVOLVEMENT

Public involvement in reporting sightings of banded (marked) harlequin ducks will be solicited through interpretive outreach programs. Local subsistence and sport hunters will be encouraged to turn in any banded and satellite telemetry implanted harlequins they may take.

Involvement will be sought from land owners, commercial operators and interested private parties within study areas. Adjacent landowners and managers will be encouraged to support and participate in studies where appropriate. Reports from cooperators of marked (banded/telemetry tagged) birds, carcasses and disturbances of birds will be encouraged through an informational newsletter. The Project Leader and each area Project Manager will be available for public information requests and local meetings. Public comment will be sought at the local level on a quarterly basis through open meetings in Kodiak and yearly through solicitation in an annual newsletter.

The newsletter interpreting project findings and progress will be produced and made available to the Trustee Council and the public in the communities of Seward, Kenai, Homer, King Salmon, Kodiak, Port Lions, Larsen Bay and Karluk. Qualified local area Natives, volunteers and local residents will be given preferred consideration for field technician and deckhand positions.

FY 96 BUDGET

Contractual	46,200.0
Commodities	200.0
Equipment	49,000.0
Travel	2,602.0
Subtotal	98,002.0
Gen. Admin.	936.5
Total	98,938.5

PROJECT DESIGN

A. Objectives

1. To test the effectiveness of satellite transmitter implants for tracking the movements of subadult male harlequin ducks.

2. To determine whether seasonal interchange occurs among harlequin duck populations in the Gulf of Alaska and Prince William Sound.

3. To determine feasibility of re-sighting colored leg bands in oil impacted areas outside Prince William Sound.

B. Methods

Satellite transmitters and population exchange - Satellite platform transmitting terminal (PTT) transmitters have proven successful in locating birds that travel extensively in remote areas (Davis and Miller 1992, Weimerskirch, et al. 1993, Ely et al. 1993, and Peterson and Douglas 1995). However, the smallest PTT currently available weighs 30 grams and this has prevented their use on birds < 1000 grams. In 1996, an implantable 20 gram PTT will be manufactured (P. Howey, Microwave Telemetry, pers. comm.) that will be will be suitable for use on harlequin ducks which weigh 650-750 grams (Bellrose 1976).

Harlequin ducks will be captured by mist-netting, net-gun, or drive-trapping (King 1973, Clarkson and Goudie 1994) at the Katmai and Kodiak Island study sites (Figure 1). Satellite transmitters will be surgically implanted in the peritoneal cavity of the bird with the antenna existing caudally. Surgery will be conducted in the field by a qualified veterinarian. In year 1, the plan is to carry on a limited study of harlequin duck movements by deploying 8 satellite transmitters on subadult males at each study site. Four transmitters will be deployed during May prior to possible molting migration and four will be deployed during the August molt prior to any fall migration. We consider this to the minimum sample size based on transmitter failure rates experienced by Peterson and Douglas (1995). Transmitters will be deployed at multiple capture sites in each study area to assure that the banded sample spatially represents the local

population.

PTT transmitters will be programmed to transmit for 6 hr every 72 hr or for 6 hr every 120 hr during the projected 4-6 mo life of the units. Transmitters will provide body temperature and remaining battery potential with each transmission. We will use Argos Standard and Animal-Tracking data processing services for the collection and dissemination of location data (Harris et al. 1990).

All ducks captured will be weighed, measured, photographed and fitted with U.S. Fish and Wildlife Service aluminum leg bands and alpha-coded colored leg bands. This color-banded sample will augment population exchange data provided by the PTT-equipped birds and will act as the primary means of detecting population interchange should the size reduction of PTT's is not achieved. The quantity of movement data provided by PTT's may be limited due to the short life of the batteries (4-6 months under ideal circumstances). To measure seasonal population exchange (autumn, winter, spring) by harlequin ducks, transmitters need to be functional for at 8-10 months. By deploying transmitters in May and August we hope to mitigate this limitation and extend the potential amount of seasonal transmitter coverage. PTT movement data may also be limited by the rocky intertidal habitats frequented by harlequin ducks. Physical interference between the transmitting antennae and satellite can influence data reception (Ely et al. 1993), especially at northerly latitudes. Additionally, the intrusive effects of internal transmitter placement on movement behavior of sea ducks is unknown.

Leg band color schemes will be used to distinguish between PWS and the three different study areas. Coordination is on-going with other harlequin duck banding researchers (Rosenberg, Goudie, pers. comm.) for band colors. Observations of color-marked ducks will be made from skiffs and on foot using binoculars and spotting scopes (Conant et al. 1988). Our experience has shown that harlequins tend to fly in a circular fashion around the survey skiff to land nearby. This facilitates reading bands with binoculars in flight and with scopes when hauled out on rocks. Harlequins usually will return to the location first flushed if flushed in a subsequent, second approach. This makes the placing of an observer with spotting scope on shore near the location of the first flush an advantage. During the molt, harlequins flee the survey skiff to haul out on rocks where leg bands can be counted. In addition, band recovery and observations will also be obtained opportunistically from hunter kills, beached birds, ancillary recordings from other seabird colony and shorebird surveys and incidental reports.

Data storage - Each Project Manager will provide computer services and produce text data in Word Perfect format and numerical data in either ASCII (comma delimited), Paradox, Arc View 2 or spreadsheet (Lotus 1-2-3 or EXCEL) formats to the Project Leader. The Project Leader will be responsible for all reports, publications and for the infusion of project data into GIS formats (ArcInfo, Arc View 2 or Atlas*GIS) for distribution to project partners, cooperators and the Trustee Council.

C. Contracts and Other Agency Assistance

Coastal logistics will be supplied by suitable government vessels for lodging and work platforms and local bush air carriers for transport to and from work sites. Coastal vessels will be cost-shared, with the Trustee Agencies providing all vessel costs above the $1,000/day proposed to be supplied by the Trustee Council. Float equipped aircraft rates quoted by OAS certified private contractors range from $200/hr for a C185 (C. Shuman, pers. comm.) to $650/hr for a Grumman Goose (PenAir, Kodiak). Government aircraft may not be available at all times or suitable for conditions, but costs may be 20-40% less than contractors. Aircraft will be used sparingly.

As a back-up measure, contract vessels are available in the range of $1,700/day (summer) or $2,500/day (winter) with private contractors (J. Rogers, M/V Kittiwake II, Inc., pers. comm.) to $3,700/day government (K. Bell, Alaska Maritime NWR). Cost hurdles aside, it is also difficult to find space on the busy schedules of these contract vessels.

Veterinary services will be provided by NBS Anchorage and contracts with wildlife veterinarians and veterinary surgeons. These contracts will be limited to travel costs - the veterinarians have agreed to donate services and veterinary supplies to this pilot study. Veterinarian vitae are included in the personnel section.

General sampling design and statistical consulting will be provided by NBS Anchorage under existing cooperative agreement and DOI-NPS Alaska Regional Office, Anchorage.

D. Location

The area of study encompasses oil impacted areas of the northeast coast of the Alaska Peninsula along the Shelikof Straits (Katmai National Park) and Kodiak Island Archipelago (Kodiak National Wildlife Refuge).

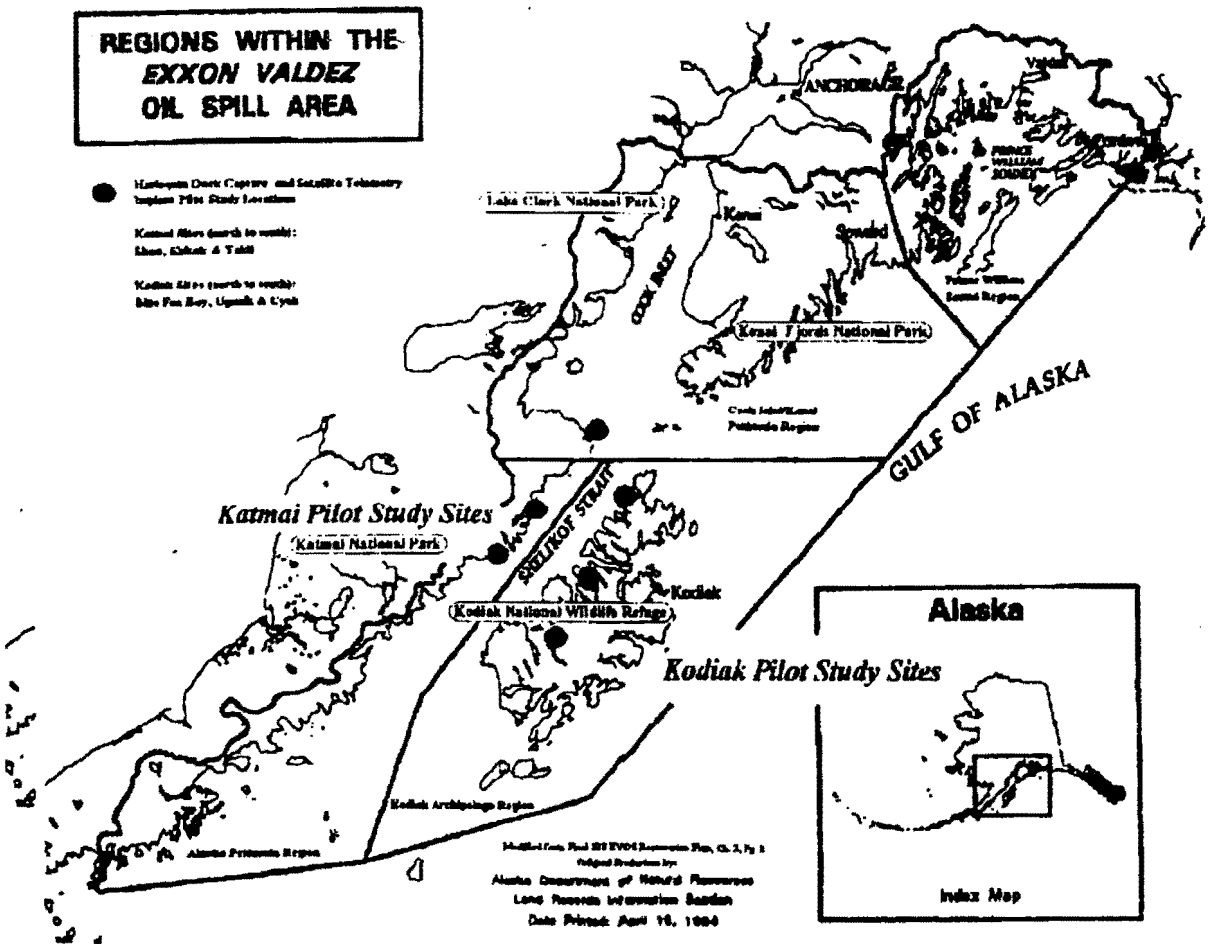


Figure 1. Proposed Study Sites Located on Katmai National Park and Kodiak National Wildlife Refuge.

Benefits from this project will be local and national. Information from this study will be useful to harlequin duck researchers and oil spill managers on both the Atlantic and Pacific coasts. Communities that may be affected by the project are proximal to the study areas. Project activities may occur in and funds may be expended in the following communities: King Salmon/Naknek, Kodiak, Seward, Homer, Seldovia, and Anchorage.

SCHEDULE

A. Measurable Project Tasks for FY 96

The following field schedule will be used on each of the 2 locations over three years: 1996, 1997 and 1998. Three years will be needed to show trends. This pilot study is intended to be one year in duration, with subsequent years subject to separate further review and approvals.

1996:

1 Nov- 30 Apr: Coordinate coastal vessel calendars, recruit crews/volunteers, produce public

	information flyers/newsletter, obtain NEPA, NPS and USFWS compliance/permits, purchase satellite transmitters, commodities, and other equipment, obtain backup/supplemental coastal vessel lease agreements, aircraft support and other services.
5 May-12 May:	Field operations begin; capture free-flying harlequins; deploy 4 satellite transmitters, banding; begin data acquisition via ARGOS.
May-August:	Continue ARGOS data acquisition.
10 Aug-17Aug:	Molting harlequin duck capture, deploy 4 remaining satellite transmitters banding and marking of all captured harlequins.
20 Aug-15 Sept:	Colored leg banding re-sightings on other surveys (not funded by this pilot study).
1 Sept-30 Sept:	Continue ARGOS data acquisition and data analysis.

FY 1997

Oct-Jan:	Continue ARGOS data acquisition, data analysis and progress report preparation (completion by 1/15/97).
March:	Draft annual report, include infusion of data into GIS system.
June:	Final annual report on FY 1996 work.

B. Project Milestones and Endpoints

Sept. 1996: First year's satellite transmitters deployed, birds banded and color marked. Initial movement data entered into GIS.

Nov. 1996: Preliminary results available on population exchange. First transmitters (May) deployed reach end of projected life span. Pre-molting movements greater than 270 kilometers will be considered to have crossed a milestone. Enter movements data into GIS.

Mar. 1997: Results of possible post-molting population exchange. Second transmitter (August) deployment reaches end of projected life span. Post molting movements greater than 270 kilometers confirmed by transmitters or banding will be considered a milestone and indicate potential for GOA and PWS harlequin populations. Movements data entered into GIS.

In addition to a 270 kilometer movement, other indicators of project success will be: (1) satisfactory surgical implantation of satellite telemetry transmitters in harlequin ducks under Alaskan marine conditions, (2) demonstrated life of new technology transmitters of 6 months or longer, (3) demonstrate feasibility of re-sighting of color leg banded harlequin ducks at a 10% or greater re-sighting rate, and/or (4) actual movement into PWS by a PTT implanted or leg-banded harlequin duck from the study sites.

The outlook should any of the aforementioned benchmarks be reached, would be to expand the number of transmitters applied to reach a more statistically robust level, expand study sites to other area partnership trustee agencies. Such study expansions are recommended to be, in priority order, Kenai Fjords National Park, Shuyak Island State Park, Lake Clark National, Becherof National Wildlife Refuge, Aniakchak National Monument and Preserve. In addition, skiff surveys of harlequin duck immature male plumage categories as a productivity index (Rosenberg) along with population abundance data collection and morphometrics indices (Esler) should be implemented in the same priority. If re-sightings of colored leg banded harlequin ducks proves feasible, extensive banding should be implemented with guidance from statisticians based on power analysis.

C. Project Reports

Jan. 15, 1997: Progress Report delivered to Trustee Council.
April 15, 1997: Annual (Final) report.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

To reduce costs this proposal will cost-share vessel expense with the Trustee Council by using government vessels stationed at KATM and KNWR. These trustee agencies will provide all annual maintenance costs, survey skiffs, crew, fuel and food for coastal vessels beyond the first $1,000/day provided by the Trustee Council. In most other areas, coastal conditions demand seaworthy vessels and experienced crews suitable for these exposed waters. Kodiak has the 48' R/V Ursa Major II and Katmai has a USCG twin-diesel 42' vessel currently being refitted for research and monitoring. Where scheduling conflicts arise, private contractors will be used if within budget.

Personnel needs will be absorbed by the trustee agencies. The core of each field team will be a wildlife biologist/USCG licensed vessel operator and a veterinarian. Qualified professional staff from the agencies and volunteers will be utilized to assist capture teams as needed. This pilot study will provide through in-kind services and expenditures an approximate 1:1 ratio (trustee agency:EVOS Trustee Council) of matching funds.

This proposal begins a regional ecosystem investigation needed for the Alaska Peninsula, Kodiak Archipelago Regions of the oil spill area. Ideally, any of the three major ecosystem studies (Sound Ecosystem Assessment, Seabird/Forage Fish Project and Nearshore Vertebrate Predators Project) in PWS, could have value in extending activity in oiled regions outside the Sound. In particular, the Nearshore Vertebrate Predators Project (025) would have the highest value and be most responsive to needs in these regions. Our proposal is limited by economic necessity to one ecosystem component area, harlequin duck monitoring as a representative ecological sentinel. This project can be implemented as either an independent coordinated operation or an extension of the 025 project, currently restricted to PWS. This study will closely coordinate and incorporate techniques developed in PWS studies on harlequin ducks, and in future years has the potential to utilize morphometric techniques for body condition

assay as described in the NVP group (025) and productivity index methods from the Harlequin Monitoring project (427).

Several current EVOS restoration project managers have been invited to consider expanding their project activities in the Alaska Peninsula Region. The KATM and KNWR vessels and staff expertise in local conditions could be utilized by investigators. Harbor seal, forage fish, Nearshore Vertebrate Predator and Harlequin monitoring groups were asked to consider new projects or extensions of current work into spill areas adjacent to PWS. Most helpful in forming objectives and hypotheses and coordinating techniques for this proposal were the Nearshore Vertebrate Predator group (Esler) and the Harlequin Monitoring project (Rosenburg). This proposal hopes to integrate in future years pertinent facets from both of these projects into its design and anticipates products complementary to both PWS studies. Productivity indices could be obtained using techniques developed by Rosenburg in PWS in 1994 and the body condition protocol and analysis would adopt Esler's proposed design. Measures of annual survival from these study sites would be valuable to compare to over-winter survival rates obtained in the PWS Nearshore Vertebrate Predator study (Esler, pers. comm.).

Few EVOS restoration funds for natural resource damage mitigation have been received by these park and refuge managers to date. This lack of activity in the field reduces opportunity for collaboration and sharing of resources, such as work platforms, transportation and field camps. To further compound the problem, agency base funding and competitive project funding for coastal monitoring and research has not been forthcoming in these EVOS spill areas. Apparently there is a belief by most funding managers that oil spill matters should be supported only by the Trustee Council, and the back-lash is so strong that even routine coastal monitoring and inventories are not funded through base-funding and funds are usually diverted to non-EVOS affected areas. EVOS funds are rare for wildlife investigations in the direct spill impacted areas adjacent to PWS. The stigma that these coasts were not only bathed in oil, but are now bathed in "spill dollars" makes funding from non-Trustee Council sources for field activities and the associated potential for collaboration equally low.

KNWR has regular winter seabird surveys and other boat-based operations during 100-150 days per year where additional band sightings can be recorded. KATM has no more than 10 days funded for seabird colony and marine mammal surveys, but has plans to program for 100 days on the water per year in the future. Other coastal vessel based surveys by trustee agencies will be used to re-sight colored leg bands applied in this study. Comparisons to previous work on harlequin duck productivity from western Kodiak Island (Zwiefelhofer 1994b) will be of high value to GOA and PWS researchers.

Consultation has been made with past harlequin duck researchers (Patten ADF&G), marine fisheries scientists (J. French, UAF Kodiak and R. Otto, NMFS, Kodiak), and coordination is maintained with the Harlequin Duck Working Group (affiliate of Pacific Seabird Group). Proposal reviews were solicited from partner Trustee agencies, USFWS - Anchorage - V. Mendenhall, ADF&G- S. Patten, T. Rothe, D. Rosenberg, USFWS Alaska Maritime Refuge - V. Byrd, DOI-NPS Alaska Regional Office - B. Rice/M. Schroeder, NBS/Anchorage - D. Esler,

NBS/Kodiak - T. Smith, NBS/Anchorage - S. Hatch, and Audubon - S. Senner. Further collaboration and consultation with state and federal biologists on refinements of technical design and methods is on-going and will continue.

ENVIRONMENTAL COMPLIANCE

NEPA compliance is expected through categorical exclusion. The Animal Welfare Act provisions will be followed. Veterinarians will be used to monitor capture events, perform anesthesia, surgery and recovery of birds. In compliance with the Migratory Bird Treaty Act banding schemes and protocol will follow USFWS and Canadian Wildlife Service sanctions and permit requirements. Coastal vessel operations will adhere to USCG and OPA '90 environmental requirements.

PERSONNEL

Overall organization will be a multi-agency partnership. The partnership effort will be comprised of two federal coastal land trustee agencies (DOI-FWS and DOI-NPS) working in close cooperation and consultation with state, borough and federal experts and planners. The operations framework is one of a modular field template implemented in each of the two locations. Project administration will be facilitated by the DOI-NPS in the Kodiak Coastal Unit office of Katmai National Park near the major areas of study. Field operations management rests with each area manager in the respective National Park or National Wildlife Refuge. Technical expertise specific to the area and logistical knowledge of the local waters important to safety and efficient implementation of the field portion of the project rest with each Project Manager.

Each of the study locations will provide resource managers as Project Managers to administer field work and supervise technicians. Project Leader responsibility will be assumed by DOI-NPS (KATM). The Project Leader will be accountable for data management, permits, reports, publications, budget/fiscal, and general administration.

Project Managers

Buddy L. Goatcher, Coastal Management Biologist, Katmai National Park and Preserve
Project Leader/Principal Investigator - Katmai (Alaska Peninsula) Project Manager,
B. S. Zoology, M.S. Wildlife, 10 years biological programs management, coastal management in Gulf of Mexico and Alaska, 3 years waterfowl and seabird surveys, participating biologist in oil fate and persistence study (EVOS Project. No. 94266), 1989 Exxon Valdez Oil Spill Task Force One Team Leader, SCAT officer - Louisiana, 10 years experience commercial fishing in Alaska (PWS), USCG Master's license. Park ArcView 2 and ARC/INFO GIS site manager.

Dennis Zwiefelhofer, Wildlife Biologist/Marine Vessel Operator, Kodiak National Wildlife Refuge, Kodiak (Kodiak Archipelago) Project Manager, B. S. Wildlife/Biology, Kodiak NWR

Biological Programs Manager, 17 years experience in avian biology; surveying and studies of seabirds, seaducks, waterfowl, and raptors. Responsible for Kodiak area post EVOS seabird surveys and bird collection (morgue) facility. Member of EVOS initial response SCAT teams. USCG Master's license. Refuge Atlas* GIS site manager.

Veterinary Support

Daniel J. Mulcahy, D.V.M.(1992), Ph.D.(1977) Microbiology, B. S. (1970) Zoology, Alaska Science Center NBS, Anchorage, 2 years veterinary contractor to government and private practices in Alaska, 10 years USFWS fisheries disease research scientist, 3 years USFWS head of research at National Wildlife Health Research Center, in Madison,Wisconsin. Over 50 scientific publications. Presently concurrent with ASC duties, Dr. Mulcahy practices small animal medicine and is a volunteer veterinarian at the Bird Treatment and Learning Center in Anchorage. He is the only veterinarian in Alaska experienced with current techniques in satellite transmitter implants, with nearly 40 surgeries completed to date. Refer to Project 95021 for Dr. Mulcahy's extensive list of professional memberships. Dr. Mulcahy is a co-Principal Investigator in Project 95021 (Murre movements-Barren Islands) and because of time constraints is only able to tentatively commit services to the spring segments of this pilot study, and general project oversight.

James C. Roush, III, D.V.M. (1966), Veterinary surgeon, 29 years practicing small animal and wildlife medicine, specializing in avian wildlife species, surgical residency 1966-1969, 26 years Board Certified Veterinary Surgeon, 24 years as a Diplomate American College of Veterinary Surgeons, 3 years Director of University of California Predatory Bird Program in Santa Cruz, 7 years as consultant to San Francisco Zoo, 5 years consulting wildlife veterinarian to Goatcher, Goatcher and Associates, and publications in Avian Surgery and two books: Zoo and Wild Animal Medicine, 1st. ed., by Murray Fowler, D.V.M. and Current Veterinary Therapy. Currently continuing to practice full-time veterinary surgery of avian and small animal species while a consultant to Ames-NASA, serving on Board of Directors of the Ventana Wilderness Sanctuary, founder of Ventana Wilderness Bald Eagle Program, and close associate of Dr. Tom Williams, D.V.M. of Monterey Bay Sanctuary Aquarium/PWS sea otter research. Dr. Roush has demonstrated experience in wildlife implant surgery with sea otters and numerous avian species. Dr. Roush will provide major veterinary services to the Katmai team, including surgical equipment, anesthetic gases and supplies.

Vicki Vanek, D.V.M., B.S. Biology/Wildlife, 1 year wildlife canid infectious disease research, 5 years clinical medicine, EVOS sea otter triage facility responsibility in Kodiak (1989), experienced in surgical implantation of radio transmitters in sea otters, seabird tissue sampling and seabird surveys over a 6 year period. Dr. Vanek has extensive experience in harlequin duck surveys with Kodiak NWR and is currently with the ADF&G Subsistence Division, Kodiak. Dr. Vanek will provide major veterinary services to the Kodiak team.

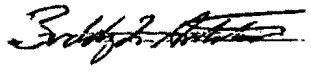
Key Supporters and Field Team Members

Alan J. Bennett, Resource Management Specialist, Lake Clark National Park - Lake Clark (Cook Inlet), B. S. , M. S. Wildlife Ecology, 20 years experience including 12 years conducting waterfowl research and surveys in coastal habitats of Cook Inlet and the Gulf of Alaska. Park ArcView 2 GIS site manager.

Thomas J. Troutman, Chief of Resource Management, Kenai Fjords National Park, Kenai Fjords (Kenai Peninsula), B.S. Zoology, M.A.T. Science Education, 8 years in resource management at Delaware Water Gap NRA, Cape Lookout National Seashore, and Kenai Fjords National Park. Work experience includes ecological studies on barrier island systems and monitoring colonial nesting birds. Park ArcView 2 GIS site manager.

Michael D. Tetreau, Resource Management Specialist, Kenai Fjords National Park, Kenai Fjords (Kenai Peninsula), B.S. Wildlife and Wildland Recreation Management, 6 years in resource management at Kenai Fjords N.P. including 2 years working directly on EVOS-related issues and 4 years supervising coastal resource management operations.

Project Leader/Manager:



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907/486-6730; 907/486-3331 fax

July 14, 1995
Date prepared

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8 '595 Revis

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	PROPOSED FFY 1996 TRUSTEE AGENCIES TOTALS					
			Katmai NPS	Kodiak NWR				
			$49,469.3	$49,469.3				
Personnel	$0.0	$0.0						
Travel	$0.0	$2,602.0						
Contractual	$0.0	$46,200.0						
Commodities	$0.0	$200.0						
Equipment	$0.0	$49,000.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$0.0	$98,002.0	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration	$0.0	$936.5						
Project Total	$0.0	$98,938.5	$167,500.0	$167,500.0	$0.0	$0.0	$0.0	$0.0
Full-time Equivalents (FTE)	0.0	0.0						
	Dollar amounts are shown in thousands of dollars.							
Other Resources	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

Comments:

We apologize in advance for problems with templates. FTEs not included as absobed by trustee agencies. Please call Buddy Goatcher at 907/486-6730 for clarification and further info. We would be glad to provide a detailed break-down of matching funds supplied by our agencies if needed.

Only used last set of templates (scroll to bottom first).

Thank you.

1996

Prepared:

Project Number: 96161
Project Title: Pilot Study Harlequin Duck Population Interchange in Oil Spill Affected Areas of the Alaska Peninsula and Kodiak Archipelago Determined by Satellite Telemetry
Lead Agency: DOI - NPS Katmai National Park

FORM 2A
PROJECT
DETAIL

7/14/95

1996 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS					
Personnel		$0.0						
Travel		$0.0						
Contractual		$0.0						
Commodities		$0.0						
Equipment		$0.0						
Subtotal	$0.0	$0.0	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration		$0.0						
Project Total	$0.0	$0.0						
Full-time Equivalents (FTE)		0.0						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

1996

Prepared:

Project Number: 96161
Project Title: Pilot Study Harlequin Duck Population Interchange in Oil Spill Affected Areas of the Alaska Peninsula and Kodiak Archipelago Determined by Satellite Telemetry
Lead Agency: DOI - NPS Katmai National Park

FORM 3A
AGENCY
PROJECT
DETAIL

7/14/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

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

1996

Project Number: 96161
Project Title: Pilot Study Harlequin Duck Population Interchange in Oil Spill Affected Areas of the Alaska Peninsula and Kodiak Archipelago Determined by Satellite Telemetry
Lead Agency: DOI - NPS Katmai National Park

FORM 3B
Personnel
& Travel
DETAIL

7/14/95

1996 EXXON VALDEZ TRUS... COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Commodities Costs:	Proposed FFY 1996
Description	
Commodities Total	$0.0

1996

Project Number: 96161
Project Title: Pilot Study Harlequin Duck Population Interchange in Oil Spill Affected Areas of the Alaska Peninsula and Kodiak Archipelago Determined by Satellite Telemetry
Lead Agency: DOI - NPS Katmai National Park

FORM 3B
Contractual & Commodities DETAIL

7/14/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1995 - September 30, 1996

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

Existing Equipment Usage: Description	Number of Units	Inventory Agency

1996

Project Number: 96161
Project Title: Pilot Study Harlequin Duck Population Interchange in Oil Spill Affected Areas of the Alaska Peninsula and Kodiak Archipelago Determined by Satellite Telemetry
Lead Agency: DOI - NPS Katmai National Park

FORM 3B
Equipment
DETAIL

7/14/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS					
Personnel		$0.0						
Travel		$2,602.0						
Contractual		$46,200.0						
Commodities		$200.0						
Equipment		$49,000.0						
Subtotal	$0.0	$98,002.0	Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration		$936.5						
Project Total	$0.0	$98,938.5	$167,500.0	$167,500.0	$0.0	$0.0	$0.0	$0.0
Full-time Equivalents (FTE)		0.0						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

1996

Project Number: 96161
Project Title: Pilot Study Harlequin Duck Population Interchange in Oil Spill Affected Areas of the Alaska Peninsula and Kodiak Archipelago Determined by Satellite Telemetry
Lead Agency: DOI - NPS Katmai National Park

FORM 3A
AGENCY
PROJECT
DETAIL

Prepared: 7/14/95

1996 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1995 - September 30, 1996

Personnel Costs:			GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	Proposed FFY 1996
PM	Name	Position Description					
	none	cost absorbed by trustee agency					0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		0.0	0	0	
Those costs associated with program management should be indicated by placement of an *.						**Personnel Total**	$0.0

Travel Costs:		Ticket Price	Round Trips	Total Days	Daily Per Diem	Proposed FFY 1996
PM	Description					
	Principle Investigator's Travel to EVOS Science Workshop (Anch)					0.0
	Goatcher	176	1	5	225	1,301.0
	Zwiefelhofer	176	1	5	225	1,301.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
Those costs associated with program management should be indicated by placement of an *.					**Travel Total**	$2,602.0

1996

Project Number: 96161
Project Title: Pilot Study Harlequin Duck Population Interchange in Oil Spill Affected Areas of the Alaska Peninsula and Kodiak Archipelago Determined by Satellite Telemetry
Lead Agency: DOI - NPS Katmai National Park

FORM 3B
Personnel
& Travel
DETAIL

7/14/95

Contractual Costs:		Proposed
Description		FFY 1996
Coastal vessel leases, includes fuel, food, crew at $1,000/day x 28 days		28,000.0
ARGOS Standard Animal Tracking Services (satellite subscription)		15,200.0
Veterinary services contracts		3,000.0
When a non-trustee organization is used, the form 4A is required.	**Contractual Total**	$46,200.0

Commodities Costs:		Proposed
Description		FFY 1996
Colored leg bands, waterfowl		200.0
	Commodities Total	$200.0

1996

Project Number: 96161
Project Title: Pilot Study Harlequin Duck Population Interchange in Oil Spill Affected Areas of the Alaska Peninsula and Kodiak Archipelago Determined by Satellite Telemetry
Lead Agency: DOI - NPS Katmai National Park

FORM 3B
Contractual & Commodities DETAIL

7/14/95

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FFY 1996
Satellite telemetry transmitters (PTT) implantable	16	3,000	48,000.0
Capture pens, PVC pipe/web	2	500	1,000.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$49,000.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency
none		

1996

Project Number: 96161
Project Title: Pilot Study Harlequin Duck Population Interchange in Oil Spill Affected Areas of the Alaska Peninsula and Kodiak Archipelago Determined by Satellite Telemetry
Lead Agency: DOI - NPS Katmai National Park

FORM 3B
Equipment
DETAIL

7/14/95