Retrospective Analysis of 30 Years of Seabird Distribution and Diet Data

Project Number:	~~New~~ 02664
Restoration Category:	Research
Proposed By:	USGS
Lead Trustee Agency:	DOI
Cooperating Agencies:	USFWS
Duration:	3-year project
Cost FY 02:	$287,600
Geographic area:	Gulf of Alaska, North Pacific
Injured resource:	Multiple

ABSTRACT

As a group, seabirds are excellent indicators of change in the marine environment: They forage over the entire ocean and are relatively easy to census (once you get out there), species assemblages often demarcate important ecological zones (e.g., oceanographic domains, fronts), they sample a variety of keystone forage species, and they gather conveniently in large, multi-species colonies where we can assess their diets and breeding biology with relative ease. In short, seabirds integrate information about our oceans over multiple scales of time and space.

An enormous amount of data on the abundance, distribution and dietary habits of seabirds in Alaska have been gathered at great expense over the past 30 years, but most of it has not been analyzed beyond the scale at which it was gathered. We believe it is time to take stock of the data that has been acquired and see what it might reveal about Alaska marine ecosystems. We propose to compile some historical seabird data sets and create accessible data archives as a tool for assessing past and future human impacts on seabird populations, a foundation for future studies, and to test the some basic hypotheses about the effects of regime shifts on diets and distribution of seabirds in Alaska.

INTRODUCTION

Atmospheric and ocean climate data are consistent in suggesting that environmental conditions in the NE Pacific cycle between warm and cold phases on a multi-decadal time scale (Ware 1995, Francis et al. 1998). At least two cycles are apparent in this century, with strong phase reversals occurring around 1925, 1947 and 1977 (Mantua et al. 1997). The Aleutian Low Pressure system shifted and intensified during the late 1970's, leading to stronger westerly winds

and warmer surface waters in the Gulf of Alaska (GOA). Warm water periods were associated with marked increases in groundfish recruitment (Hollowed and Wooster 1992) and salmon catches in Alaska (Francis and Hare 1994). Conversely, some populations of marine birds and mammals in the GOA declined during the recent warm water regime, possibly because of a change in availability of forage species (Piatt and Anderson 1996, Merrick et al. 1997). The mechanisms by which a shift in ocean climate effected these changes in trophic stucture are unknown (McGowan et al. 1998).

A recent analysis (Anderson and Piatt 1999) suggests that the shift in climate regime in the late 1970's triggered a complete reorganization of community structure in the Gulf of Alaska ecosystem. Important forage taxa such as pandalid shrimp, capelin, herring, Atka mackerel, and greenling declined and have yet to recover, probably owing to a combination of recruitment failure, predation and commercial fishing. This trophic reorganization apparently occurred at the expense of piscivorous marine birds and mammals. During the initial transition in the early 1980's, as stocks of common forage species such as capelin and herring collapsed, these fatty fish disappeared from diets of seabirds and marine mammals and were replaced largely by lean juvenile pollock (Piatt and Anderson 1996, Merrick et al. 1997). Pollock have substantially lower energetic value than more typical forage species such as capelin (Van Pelt et al. 1997) and are not assimilated as efficiently by growing seabird chicks (Romano et al. 1998). Predators would have to catch and eat nearly twice as much pollock than capelin to satisfy metabolic demands, and presumably expend more foraging effort to do so. Thus, the change in predator diets may have had a negative effect on productivity, recruitment and survival in marine birds and mammals.

Forage species continued to be scarce through the 1980's and 1990's, and even the availability of juvenile pollock may have diminished in recent years because stocks of large groundfish such as arrowtooth flounder and halibut have grown to dominate the fish community. Models suggest that groundfish now consume more forage (particularly juvenile pollock) than are calculated to exist from recruitment models in the GOA-- and 1-2 orders of magnitude more than that taken by all seabirds, marine mammals and fisheries *combined* (Hollowed et al. 1998). Similar events occurred in the Bering Sea, where forage fish species such as capelin disappeared from diets of marine birds and mammals during the 1980's (Hunt et al. 1996, Springer 1998) and large predatory groundfish now dominate the marine food web there (Livingston 1993).

The large-scale effects of these changes in forage fish abundance and distribution on the pelagic ecology and distribution of seabirds in Alaska is unknown. While a great deal of distributional data on seabirds was gathered during the 1970's and early 1980's (Figure 1), little of the data collected in later studies (Table 1) has been compiled or analyzed beyond the scale at which they were collected. Elsewhere, it is apparent that major shifts in seabird abundance and distribution can occur in response to both short-term and long-term changes in marine climate (Ainley et al. 1995).

NEED FOR THE PROJECT

A. Statement of the Problem

Stated goals of the EVOSTC Gulf Ecosystem Monitoring plan are to detect annual and long-term trends in the marine ecosystem, identify causes of change in the ecosystem, and to provide integrated data to resource managers to allow them to respond to changes in natural resources. One way to achieve these goals is to examine historic biological data for patterns and relate those to environmental variables. In recent years, analyses of a variety of historical data sets have proven valuable for understanding long-term biological effects of climate change in the North Pacific (Hollowed and Wooster 1992, Francis and Hare 1994, Hunt et al. 1996, Piatt and Anderson 1996, Hayward 1997, McGowan et al. 1998, Springer 1998, Mackas et al. 1999, Anderson and Piatt 1999). We propose to compile and analyze historical data on the diets and distribution of seabirds in Alaska during the past 30 years, and integrate the results with current models of climate change. The need for retrospective analyses of data is explicitly identified in the FY2002 invitation for restoration proposals.

B. Rationale

Although a growing body of evidence suggests that ocean climate has a profound effect on seabird and mammal populations-- mediated by changes in the forage base-- it remains a complicated research issue (Springer 1998). Whereas *some* populations of seabirds and mammals at *some* locations in the GOA and Bering Sea have exhibited signs of food stress (lower productivity, population declines, mass starvation) during warm regime conditions (Piatt et al. 1990, Piatt and Anderson 1996, Piatt and Van Pelt 1997, Hunt et al. 1996), other populations have fared well and even increased in some areas (Hatch and Piatt 1995, Piatt and Goley 1996, Byrd et al. 1998, Springer 1998).

Little is known about long-term variability in the distribution of seabirds at sea. During the Outer Continental Shelf Environmental Assessment Program (OCSEAP) of the 1970's, the first major effort to gather and assimilate these data was undertaken. This work culminated in an atlas of "Pelagic Distribution and Abundance of Seabirds in the Gulf of Alaska and Eastern Bering Sea" (Gould et al. 1982), which documented the at-sea distribution and abundance of 16 common seabird species in one degree latitude-longitude blocks. In addition to this landmark work, reports by other key investigators (e.g., Hunt et al. 1981) laid the foundation for our understanding of the pelagic biology and distribution of seabirds in Alaska.

The OCSEAP surveys (Figure 1) provide a useful starting point for examining the pelagic ecology of seabirds in Alaska and for identifying important ecological areas of the Bering Sea. For example, Common and Thick-billed Murres are the dominant avian consumers of forage fish in the Gulf of Alaska and Bering Sea during summer when birds forage around their colonies (Figure 2; J. Piatt and G. Ford, unpubl. analysis of OCSEAP data). In winter, murres move

away from colony centers and concentrate around the Kodiak and Shumagin islands in the Gulf of Alaska, and along the SE Bering Sea shelf.

However, the OCSEAP data alone do not allow for consideration of long-term changes in bird distribution. Since the pelagic atlas was produced, a considerable amount of new data has been collected on the distribution of seabirds in the Bering Sea and other areas of the North Pacific (e.g., Hunt & Harrison 1990, Piatt et al. 1990, 1991, 1992, 1997, 1998a; Schauer 1992, Elphick & Hunt 1993, Hunt et al. 1993, Gould & Piatt 1993). By combining all available datasets from these and other unpublished studies, in addition to data on seabird diets, it should be possible to assess whether patterns of seabird distribution or species composition have changed as food supplies and marine climate fluctuated during the past 30 years (per Ainley et al. 1995. Additionally, it will be possible to examine the distribution of individual species and the seabird community as a whole to determine which areas of the Gulf of Alaska and Bering Sea are most critical for seabirds, and identify areas of highest trophic importance.

B. Location

The project is entirely office based, and will take place in centers of the principal investigators and collaborators.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

None in this project, which will draw only upon existing data.

PROJECT DESIGN

A. Objectives

We have three main objectives that can be attained within a 3-year time-frame.

1) Compile and analyze historical data on seabird abundance and distribution at sea in Alaska, and other areas of the North Pacific.

2) Compile and analyze historical data on seabird diets in Alaska.

3) Conduct retrospective analyses of seabird diet and distribution data in relation to environmental variables (e.g., climate, forage fish abundance, etc.) to assess how different seabirds responded to the shift from a cold regime to a warm regime in the late 1970's.

B. Methods

Retrospective analyses cannot begin until all available data have been compiled and arranged in compatible formats. This requires a large effort in data management and hiring of personnel to accomplish the task. We will undertake the compilation of two major databases.

Diet Database

Information on diets is available from scattered sources and are not readily accessible in a uniform database. Most information on diets of seabirds collected in Alaska (>3500 specimens) prior to 1980 were compiled under the Outer Continental Shelf Environmental Assessment Program (OCSEAP) and at least half that data are available in digital form from the National Oceanographic Data Center (NODC). Since that time, numerous seabird stomachs or chick meals have been collected in Alaska by relatively few investigators in USGS, FWS and at different universities (e.g., Hatch and Sanger 1992, Hobsen et al. 1994, 1997; Hunt et al. 1996, Piatt and Anderson 1996, Springer et al. 1996, Byrd et al. 1997, Piatt et al. 1998a). We estimate that the largest data sets available are, in fact, our own: Piatt has diet data from about 4200 adult seabirds collected largely in the Gulf of Alaska, Aleutians, and Bering Sea between 1987 and 1999, while Springer has diet data from about 3500 seabirds collected in the Aleutians, Bering and Chukchi Sea between 1976 and 1999. Byrd has ca. 1500 samples from the Aleutians, and Irons has a similar number from Prince William Sound. Most samples are from murres, kittiwakes, puffins, gulls and cormorants, but some 35 species are known to have been sampled. In addition to adult samples, we also have data on an estimated 5000 chick meals collected largely from puffins, auklets and kittiwakes in the Bering Sea during the past 20 years. We estimate that some 3-5000 other samples of adult and chick diets may reside with other investigators or are available from literature. George Hunt (U.C. Irvine) has data on some 1500+ stomach samples, largely from the Bering Sea, and will make those data available to us. We propose to use contracts to facilitate compilation of data outside DOI and UAF (Springer).

We will analyze the 20,000+ diet samples for spatial and temporal patterns among species. At large spatial scales, we will examine and contrast diet patterns within large oceanographic regions (e.g., Gulf of Alaska, Aleutians, Bering Sea, Chukchi Sea), focusing on those species (e.g., murres, kittiwakes) for which samples permit such a broad comparison. At smaller scales, we will identify patterns within regions, and try to relate diets to available information on local forage fish abundance and regional differences in habitat (e.g., outer domain and shelf-edge versus middle domain in the Bering Sea). At large temporal scales, we will analyze diets from areas with sufficient historical data to assess whether diets in any or all areas changed from before and after the 1997 regime shift. At smaller temporal scales, we will examine annual variability in diets at a few locations where sampling is adequate for this level of analysis.

Following these analyses, we will relate long-term changes in diet to changes in marine environments observed over the past 30 years. We (and collaborators) will attempt to answer such questions as: Did the regime shift affect diets of seabirds in the Gulf of Alaska and other regions? Were changes in diets concordant among regions? Were changes associated with known changes in forage fish availability, marine climate or other variables (e.g., timing of peak zooplankton biomass, abundance of potential competitors such as groundfish, etc.)? If diets did not change in some areas, why not? Finally, we will link diet information with patterns of pelagic distribution to estimate biomass and energy demand of seabirds over space and time (see below).

Pelagic Distribution Database

Data on the pelagic distribution and abundance of seabirds are critical for understanding the basic ecology of marine birds, monitoring population trends, assessing impacts of human activities, identifying critical marine habitats, and educating the public about seabird conservation. For example, pelagic abundance data can be used to assess immediate (Piatt et al. 1990) and long-term (Klowsieski & Laing 1994) impacts of oil pollution on marine bird populations; model and predict the impact of oil pollution on seabird colony populations (Ford et al. 1982, 1987); assess long-term changes in marine ecosystems (Ainley et al. 1995; Veit et al. 1996; Agler et al. 1999); identify fine- and coarse-scaled features of marine ecosystems (Piatt et al. 1991, 1992; Elphick & Hunt 1993), estimate population sizes of rare or threatened species that are impossible to census using traditional methods (Piatt & Ford 1993; Agler et al. 1998; Kendall & Agler 1998), and to examine seasonal movements and winter habitat use by seabirds (Piatt & Naslund 1995; Agler et al. 1998). These data could also be used to assess potential conflicts between commercial fisheries and marine birds (e.g., long-line fisheries and albatrosses), plan and manage marine reserves (e.g., Pribilof Islands, Glacier Bay National Park, Beringia International Park and Preserve), or as a tool for disseminating natural history information to the general public, educators, and the tourism industry.

We will compile pelagic seabird distribution data and produce GIS maps for analyzing and displaying the data. The original atlas by Gould et al. (1982) included about 9,300 km^2 of shipboard and aerial transects conducted in Alaska mostly between 1975 and 1978. In total, the final OCSEAP database included survey data from about 63,000 km^2, collected between 1975 and 1984 (Figure 1). This database contains more than 325,000 records, with observations of more than 4 million birds and mammals. We have already re-compiled and begun to catalog these original OCSEAP data. More work is needed to proof this large dataset, and complete a cross-reference catalog of surveys (cruises, investigators, dates, locations, etc.). We also need to compile and integrate more recent databases from agency and private sources (Table 1), including about 61,000 km^2 of survey coverage in the Aleutians, Bering Sea, Chukchi Sea, Gulf of Alaska and North Central Pacific. All the known investigators with data (Table 1) have agreed in principle to provide data pending (in some cases) resolution of funding needs to compile the data and/or agreements on collaborative use of data for publications. Some raw datasets are already in hand (Piatt, Irons, Lindell, Byrd, Laing) or readily accessible (Hunt).

At present, the major technical task is to obtain the more recent data from different investigators, format all the databases into a common archive format, proof these databases, and develop some programs for pulling out subsets of the data for mapping and statistical analyses. Over the few decades, bird survey data have been stored in a variety of formats and on a variety of media. Some of these data remain on paper data forms, but most have been entered into various computer database systems in varying formats. In the majority of cases, researchers collected data using similar field techniques so that the data are directly comparable and can potentially be stored and accessed using the same software for all data sets. Some data will require separate treatment (e.g., small-boat surveys, aerial surveys). Before a common interface can be

constructed, all the data sets must be placed in a common format. This process is time consuming because of the different media and storage formats and the constant need for weeding out errors in the data and in programs used to manipulate the data. In some cases, data conversion is straightforward; in other cases it is necessary to write programs to carry out the conversion. Once data are stored in a common format, we will construct an interface that will allow users to access and view subsets of the database using logical masks for date, geographic area, species, etc. Users will be able to view the data as observations, isopleths of density, or as rectangular blocks scaled for density. Data subsets will be exportable as ASCII, DBASE, or EXCEL type files. Geographic objects such as isopleths of density or grids will be exportable in ASCII or ArcView compatible formats.

Once compiled, we will analyze the pelagic distribution data for spatial and temporal patterns. First, the overall distribution of all species in the Gulf of Alaska will be mapped by season (spring, summer, fall, winter). Second, we will identify which datasets or areas contain time-series data adequate for assessing changes in seabird distribution or species composition over decadal periods and conduct those analyses. Third, we will combine distributional data with diet information (above) and estimates of food requirements to map the distribution of energy demand by individual seabirds and by the seabird community as a whole in the Gulf. From these analyses we should be able to answer some basic questions: Has the distribution and abundance of seabirds at sea changed during the past 30 years? If so, were these changes associated with changes in marine climate or oceanography? Where are the most significant concentrations of seabirds in the Gulf at different times of year, and why do they aggregate in those areas? Where do rare and/or declining species forage, and what do we know about the ecology of those areas?

C. Cooperating Agencies, Contracts and Other Agency Assistance

The USGS will take the lead on compiling the datasets in collaboration with USFWS (Migratory Bird Management, Alaska Maritime National Wildlife Refuge). Contracts will be established with universities and private investigators to acquire other outstanding datasets, and for developing the pelagic database and programs for manipulating the database.

SCHEDULE

A. Measurable Project Tasks for FY 02

Oct 1:	Initiate hire of technical assistants
Oct 1:	Initiate contracts for data processing, compilation
Oct - Sep:	Data acquisition, formatting, proofing, documentation, archival
Oct - Mar:	Programs developed for database synthesis
Dec - May:	Programs developed for database manipulation and mapping
Sep 30:	Working database (incompleter), and completion of programs for adding new data and manipulating database to generate products (maps, datasets)

B. Project Milestones and Endpoints

1) Compile historical data on seabird abundance and distribution at sea in Alaska into a pelagic seabird database with documentation and metadata, software capable of managing database into the future, and for generating sub-datasets suitable for mapping and analyses [completed Sep. 2003]

2) Compile historical database on seabird diets in Alaska into single Access database with documentation and metadata, and suitable for subsequent analyses of diet patterns and trends of common Alaska seabirds [completed Sep. 2003].

3) Conduct retrospective analyses of seabird diet and distribution data in relation to environmental variables (e.g., climate, forage fish abundance, etc.) to assess how different seabirds responded to the shift from a cold regime to a warm regime in the late 1970's [completed Sep. 2004].

C. Completion Date

September 30, 2004

PUBLICATIONS AND REPORTS

Apr 15, 2003 Progress Report
Sep 30, 2003 Pelagic and diet databases in CD
Apr 15, 2004 Progress Report
Sep. 30, 2004 Final Report

One final product will be a multi-authored publication entitled "The Marine Ecology of Seabirds in Alaska" which would contain a synthesis and distillation of data on seabird distribution, foraging behavior and feeding ecology of the common breeding seabirds of Alaska in relation to their marine environment.

NORMAL AGENCY MANAGEMENT

One might imagine that compiling these databases would fall under the normal agency activity of the FWS or USGS, but the fact is that in 10 years of trying, we have never obtained support for this project from our own agencies. So it is fair to say that our agencies do not consider the compilation and analyses of these data part of their normal duties. If databases can be compiled and archived, however, the FWS would manage the database in the future.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

This study would include many investigators who have been previously associated with EVOSTC projects. Most importantly, this project would result in the compilation and archival of all pelagic distribution and diet data collected under previously funded EVOSTC projects, including marine bird surveys conducted in Prince William Sound (1989-2000), along the Kenai Peninsula, and in Cook Inlet (1995-1999). Similarly, all diet data collected under the APEX program, and in previous studies in PWS and Cook Inlet would be assimilated into the databases. These databases would provide the foundation for future GEM databases and assist in the development of new GEM programs.

PRINCIPAL INVESTIGATOR

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PRINCIPAL INVESTIGATORS

Dr. John F. Piatt (Research Biologist GS-14, Alaska Biological Science Center, USGS, Anchorage, AK) obtained a Ph.D. in Marine Biology from Memorial University of Newfoundland in 1987. His dissertation involved seabird-forage fish interactions. Since 1987, he has studied seabirds both at colonies and at sea in the Gulf of Alaska, Aleutian Islands, and Bering and Chukchi seas. His is an author on over 90 peer-reviewed scientific publications about seabirds, fish, marine mammals, and effects of oil pollution on marine birds. Project Leader responsible for all phases of the project, coordinating among principal investigators (PI's), establishing contracts with cooperators, ensuring that the project proceeds on schedule and ensuring that products are delivered. As one of several collaborators routinely collecting seabird data, will compile and document various raw datasets.

Dr. Alan Springer (Research Associate Professor, Institute of Marine Science, University of Alaska, Fairbanks) obtained a Ph.D. in Biological Oceanography from the University of Alaska in Fairbanks in 1988. He has studied seabirds and marine food webs in all areas of Alaska and the North Pacific, and has participated in numerous ecosystem studies and retrospective analyses. He has published numerous papers on trophic studies of seabirds, as well as many other topics in marine ecology. Will be responsible for coordinating the compilation of diet data and will take lead responsibility for the retrospective analysis and write-up of diet data.

G. Vernon Byrd, Supervisory Wildlife Biologist (GS-13) with the Alaska Maritime National

Wildlife Refuge, USFWS, in Homer. Over 25 years experience studying seabirds throughout Alaska, with focus on developing methodologies for monitoring populations and productivity. Currently coordinates long-term monitoring activities on nine permanent annual study sites in Gulf of Alaska, Aleutians, Bering and Chukchi seas. Responsible for coordination and oversight of compiling and integrating pelagic and diet data collected by the Maritime Refuge.

David B. Irons, Ph.D., Wildlife Biologist, GS-12. Migratory Bird Management, USFWS. Received his PhD 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. Dr. Irons has authored or co-authored more than 30 publications, plus dozens of reports. He conducted marine bird and sea otter surveys in Prince William Sound in 1984 and 1985. He has been studying kittiwakes in Prince William Sound for 17 years and has overseen several seabird studies in the past several years, including marine bird and sea otter surveys of Prince William Sound and Cook Inlet, seabird monitoring studies on St. Lawrence Island and Little Diomede Island, studies on pigeon guillemots, seabirds and forage fish, and a cost of reproduction study on kittiwakes.

OTHER KEY PERSONNEL

Dr. Glenn Ford, Ecological Consulting Inc., 2735 N.E. Weidler St., Portland, OR 97232. (eci@teleport.com). Dr. Ford was trained in mathematical ecology at University of California, Berkeley, and did post-graduate work in the laboratories of Drs. John Wiens at Oregon State University and George Hunt at the University of California, Irvine. His company, R.G. Ford Consulting Co., specializes in computer mapping of natural resources and analyses of risks of oil spills. He has conducted studies and analyses under contract with the Minerals Management Service, the U. S. Fish and Wildlife Service, the National Marine Sanctuary Program (NOAA), the U. S. Coast Guard, the U. S. Department of Justice, State governments in California, Washington, and New Jersey, the National Audubon Society, The Nature Conservancy, World Wildlife Fund, the Oil and Gas Industry, Oil Spill Clean-up Cooperatives, and Public Utilities.

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Table 1. Summary of primary pelagic seabird datasets that may be incorporated in the pelagic seabird atlas. Area surveyed (km^2) was estimated from the numbers of transects conducted times transect area (length times width).

Source	Type	Years	Square km	Area
OCSEAP	Ship/Aerial	1976-1984	63,100	ALL AREAS
Hunt et al.	Ship	1976-1998	±20,000	BS, ALEU
Irons et al.	Smallboat	1984-1995	± 2,520	PWS, GOA
Kodiak NWR	Ship	1984-1998	± 8,100	KOD
Laing et al.	Smallboat	1989-1991	1,700	PWS
Gould et al.	Ship	1989-1992	3,350	NCP, GOA
Day et al.	Ship	1980-1988	10,160	BS, NCP
Schauer et al.	Ship	1988-1991	1,630	BS, CHUK
Piatt et al.	Ship	1988-1999	9,800	ALL AREAS
Byrd & Piatt	Ship	1995-1999	± 2,600	BS
Lindell	Ship	1993-1998	1,700	SE
TOTAL			± 125,890	

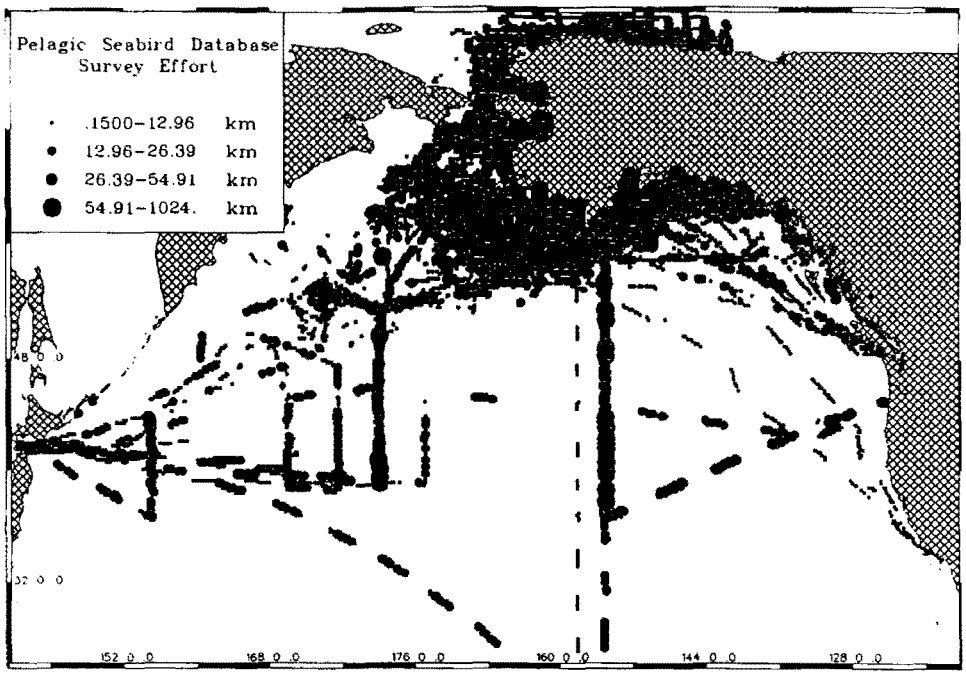


Figure 1 (above). Historical OCSEAP pelagic seabird survey effort (1975-1984). These data represent about 1/2 of total data available (but uncompiled) on seabird distribution at sea in Alaska (primarily) and elsewhere in the North Pacific.

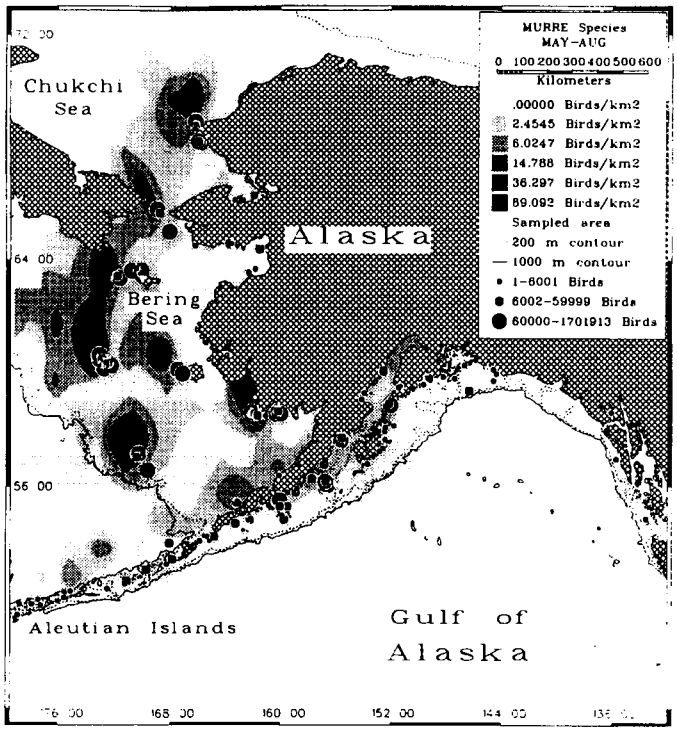
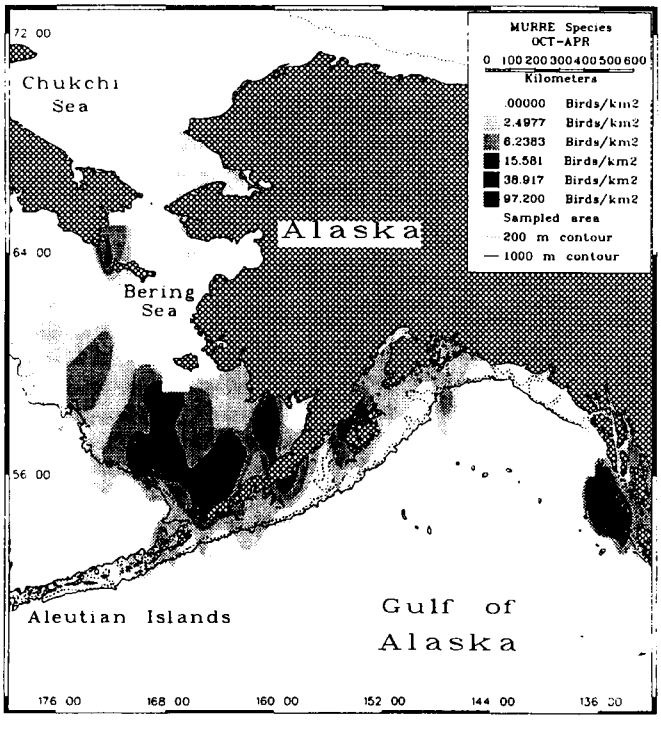


Figure 2 (above): Distribution of Common and Thick-billed Murres in summer. At-sea distribution indicated by geometrically-scaled density contours. Colonies indicated by black dots (scaled to size). Note highest densities of birds at sea around colonies.

Figure 3 (below). Distribution of Common and Thick-billed Murres in winter. Note lack of association with colonies, in contrast to above.



2002 EXXON VALDEZ TRU **COUNCIL PROJECT BUDGET**

October 1, 200[illegible] September 30, 2002

Budget Category:	Authorized FY 2001	Proposed FY 2002	LONG RANGE FUNDING REQUIREMENTS					
Personnel		$135.5						
Travel		$26.4						
Contractual		$88.8						
Commodities		$10.4						
Equipment		$0.0						
Subtotal	$0.0	$261.1		FY03	FY04			
General Administration		$26.5		$230	$120			
Project Total	$0.0	$287.6						
Full-time Equivalents (FTE)		2.8						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

FY02

Prepared:

Project Number: ~~NEW~~ 02664
Project Title: Retrospective Analysis of 30 Years of Seabird Data
Agency: USGS

FORM 3A
TRUSTEE
AGENCY
SUMMARY

2002 EXXON VALDEZ TRU COUNCIL PROJECT BUDGET

October 1, 20C . eptember 30, 2002

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
Name		Position Description	Step	Budgeted	Costs	Overtime	FY 2000
Drew		USGS Wildlife Biologist (GIS)	GS-12/2	2.0	5.6		11.2
Wang		USGS Wildlife Biologist	GS-9/2	12.0	4.8		57.6
Piatt		USGS Wildlife Biologist	GS-14/1	2.0	0.0		0.0
Byrd	AMNWR	FWS Supervisory Biologist	GS-13/2	1.0	0.0		0.0
Dragoo	AMNWR	FWS Wildlife Biologist	GS-11/5	1.0	5.1		5.1
Biotech	AMNWR	FWS Biological Technician	GS-7/1	6.0	3.6		21.6
Irons	MBM	FWS Wildlife Biologist	GS-12/5	2	0		0.0
Stephenson	MBM	FWS Wildlife Biologist	GS-9/2	6	4.8		28.8
Johnson	MBM	FWS Computer Specialist	GS-12/2	2.0	5.6		11.2
							0.0
		Subtotal		34.0	29.5	0.0	
						Personnel Total	$135.5

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2000
ANC - Irvine CA	7.8	2	10	0.1	16.6
ANC - Fairbanks	0.9	2	20	0.2	5.8
ANC - Portland OR	0.5	4	20	0.1	4.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$26.4

FY02

Prepared:

Project Number: NEW
Project Title: Retrospective Analysis of 30 Years of Seabird Data
Agency: USGS

FORM 3B
Personnel
& Travel
DETAIL

2002 EXXON VALDEZ TRU COUNCIL PROJECT BUDGET

October 1, 20(. _eptember 30, 2002

Contractual Costs:	Proposed
Description	FY 2000
4A Linkage	0.0
Alan Springer (UAF) 4 months @6414 = $25,656 + UAF overhead 51.2% =	38.8
Ford Ecological Consulting	30.0
Misc. PI contracts (possiblu Day, Shauer, Hunt, LGL, Bedard, etc.)	20.0
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$88.8

Commodities Costs:	Proposed
Description	FY 2000
PC Computers x 2, peripherals, hardware	5.6
Storage media, backup hardware, x2	1.2
Arc-View spatial analyst (x 2)	3.6
Commodities Total	$10.4

FY02

Prepared:

Project Number: NEW
Project Title: Retrospective Analysis of 30 Years of Seabird Data
Agency: USGS

FORM 3B
Contractual &
Commodities
DETAIL

2002 EXXON VALDEZ TRU COUNCIL PROJECT BUDGET

October 1, 200. eptember 30, 2002

New Equipment Purchases:			
Description	Number of Units	Unit Price	Proposed FY 2000
			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

FY02

Prepared:

Project Number: NEW
Project Title: Retrospective Analysis of 30 Years of Seabird Data
Agency: USGS

FORM 3B
Equipment
DETAIL

Effectiveness Of Citizens' Environmental Monitoring Program

Project Number:	02667
Restoration Category:	Monitoring
Proposer:	Cook Inlet Keeper
Lead Trustee Agency:	ADEC
Cooperating Agencies:	
Alaska SeaLife Center:	No
Duration:	1st year, 1-year project
Cost FY 02:	$16,700
Cost FY 03:	
Geographic Area:	Cook Inlet basin
Injured Resource/Service:	This project takes an ecosystem approach towards monitoring and restoration and will result in direct and indirect benefits to all injured resources and lost or reduced services located in the Cook Inlet basin.

ABSTRACT

Cook Inlet Keeper will analyze five years of past data from the Keeper's Citizens' Environmental Monitoring Program (CEMP): the first consistent, credible, and coordinated community-based water quality monitoring program in Alaska. Keeper's Stream Ecologist will determine if sampling frequency, methods, parameters, and site selection are effective at meeting the monitoring objectives of detecting significant changes in water quality over time. The results will assist Cook Inlet Partners (Kenai Watershed Forum, Anchorage Waterways Council, Wasilla Soil and Water Conservation District) refine their community monitoring efforts and may lead to future community-based monitoring programs.

INTRODUCTION

Cook Inlet Keeper is requesting one year of funding from the EVOS Trustee Council through the Ecosystem Synthesis/GEM Transition: Community-Based Monitoring Programs. This project will analyze past data collections that will lead to more effective and scientifically defensible community monitoring efforts.

In 1996, Cook Inlet Keeper established its Citizens' Environmental Monitoring Program (CEMP) to actively involve citizens in collecting reliable water quality data in the Cook Inlet Basin. With funding from Alaska's Department of Environmental Conservation and guidance from a Technical Advisory Committee, Keeper developed a Kachemak Bay Pilot Project as a working template that could be adopted by other groups interested in conducting citizen-based monitoring programs. The objectives of CEMP are to 1) inventory baseline water quality in the Cook Inlet Basin, 2) detect and report significant changes and track water quality trends, and 3) raise public awareness of the importance of water quality through hands on involvement. Water quality parameters, data quality objectives, and site selection criteria were developed with a Technical Advisory Committee made up of professionals representing various federal, state, and local agencies and diverse scientific backgrounds.

In 1999, Keeper entered into an agreement with the Anchorage Waterways Council and the University of Alaska Anchorage's Environment & Natural Resources Institute to facilitate citizen-based water monitoring and assessment of the Anchorage Bowl. Keeper then entered into a similar agreement with the Wasilla Soil and Water Conservation District to begin monitoring in the Mat-Su Valley. As interest in CEMP continues to grow, there is a need to evaluate the effectiveness of the monitoring protocols and sampling design to meet the monitoring objectives. Keeper proposes to analyze five years of CEMP data to determine if sampling frequency, methods, parameters and site selection are effective at detecting significant change in water quality over time. These results will be useful to GEM when citizen-based monitoring programs are considered for funding in the future.

NEED FOR THE PROJECT

A. Statement of Problem

One of the biggest challenges to restore habitat and water quality following the *Exxon Valdez* oil spill has been the lack of adequate baseline data describing conditions before the spill. Since the oil spill, scientist have worked diligently to collect information describing recovery of species and habitats. But until recently there was no comprehensive long-term study to document water quality conditions in Southcentral Alaska. Baseline information provides a benchmark for measuring future changes in water quality and a basis for developing and implementing pollution prevention and best management practices.

As state and federal budgets for water quality monitoring continue to decline, citizens have stepped in to gauge the health of our public resources. Despite various philosophies on the environment, everyone agrees that clean water and healthy fisheries should be protected. Diverse stakeholders such as fishermen, landowners, outdoor enthusiasts, Alaska Natives, scientists, educators, families, conservationists, and decision makers are expressing a desire to better understand and protect our water resources. Cook Inlet Keeper is leading the way and providing citizens with the opportunity to expand our knowledge of the Cook Inlet watershed.

Since Cook Inlet Keeper established Alaska's first consistent, credible, and coordinated volunteer water quality monitoring program in 1996, other groups throughout Alaska have requested Keeper's assistance in establishing volunteer monitoring in their communities. Toward that end, Keeper has formally partnered with the Anchorage Waterways Council, Kenai Watershed Forum, and Wasilla Soil and Water Conservation District to train more than 200 volunteers throughout the Cook Inlet watershed to monitor more than 90 freshwater and estuarine sites. With five years of data collected, it is important to ensure that sampling frequency, methods, parameters, and site selection are effective at meeting the monitoring objectives of detecting significant changes in water quality over time.

B. Rationale/Link to Restoration

Developing a monitoring system to detect and recognize significant change is challenging because natural systems are inherently dynamic and spatially heterogeneous. Many changes are not a result of human activity and are reflective of natural variability. An important step of every monitoring program is determining if the project objectives can actually be attained by the methods, parameters, and analyses used. To determine if a monitoring program is successful at detecting real change and not just natural variability, the statistic power of the monitoring design needs to be assessed.

With five years of data collected, Keeper can now determine if the CEMP protocols influence data variability which can affect data interpretation. Improvements in sampling protocols can then be made to better represent water quality in the Cook Inlet basin. Determining the effectiveness of CEMP protocols will ensure that monitoring projects developed by current partners (Anchorage Waterways Council, Kenai Watershed Forum, and Wasilla Soil and Water Conservation District) as well as future citizen-based programs around the Gulf of Alaska will be successful in detecting changes in water quality over time.

C. Location

The Cook Inlet watershed was hit hard by the *Exxon Valdez* oil spill. The currents in the Gulf of Alaska caused oil to move up into Cook Inlet, along the Kenai Peninsula and back down the Alaska Peninsula, soaking much of the shoreline and ocean floor with crude oil. As a result, many of Cook Inlet's coastal resources, and the services which they support, were impacted.

Although some recovery has occurred, Cook Inlet's sensitive resources face ongoing threats from a host of unsustainable activities, including rapid filling of wetlands; additional oil spills from an aging oil and gas infrastructure; discharge of pollutants from industrial activities; and increased nonpoint runoff from population growth and sprawl. Approximately 400,000 people, nearly 2/3 of Alaska's population, live in the vast Cook Inlet watershed, and a population

increase of 600% over the past thirty years has substantially magnified pressures on Cook Inlet's sensitive resources.

Communities involved in and affected by Keeper's Citizen Environmental Monitoring Program include Wasilla, Anchorage, Kenai, Soldotna, Ninilchik, Anchor Point, Homer, Seldovia, Port Graham, Nanwalek, and others. Citizens throughout the Cook Inlet watershed will benefit from refinements or changes that are made to CEMP protocols based on the results of this project. Citizens in other Gulf of Alaska watersheds will benefit when future citizen-based monitoring programs are developed.

COMMUNITY INVOLVEMENT AND TRADITIONAL KNOWLEDGE

Because citizens are the true owners of public water resources, Keeper strives to involve them in hands on activities aimed at improving and protecting habitat and water quality and promoting resource stewardship. Citizen-based monitoring is a community-owned and community-driven effort. It is a highly effective way to bridge the gap between citizens and natural resource agencies. Citizens are directly involved in collecting and tracking water quality information, and have a greater sense of ownership of the monitoring findings.

Citizen monitoring is also an important way to integrate traditional environmental knowledge (TEK) with science. Many of the citizens who become involved in the monitoring efforts have a long history with their local regions. Keeper is set to begin working with Alaska Native organizations, including the Port Graham/Nanwalek Watershed Council and Ninilchik Traditional Council in citizen monitoring efforts. Keeper recognizes the powerful role that TEK can play to further water quality monitoring goals. Visual and other observations through narration, photographs and sketches may be one way to better incorporate TEK into citizen-based monitoring, and Keeper will continue to work to strengthen TEK components.

As part of citizen-based monitoring, participating communities have access to project information because they own and drive the project. Keeper compiles and presents all collected

water quality monitoring findings in a variety of ways. In addition to publishing formal reports with narrative, charts, graphs, GIS maps and photos, Keeper also publishes monitoring information in its bi-annual newsletter and on its web page. Keeper often incorporates photos and GIS maps of water quality monitoring sites in its reports, articles, and web page as visual tools to help citizens understand the monitoring efforts.

Keeper values community participation, and believes the best way to involve people is by traveling to communities to gain a better understanding of local needs and interests. In 1998, Keeper produced the *Cook Inlet GIS Atlas* on CD ROM which synthesizes more than 125 computer map layers of pollution, habitat, streams, and other information. Keeper worked with over 20 community-based groups to take the CD ROM to 13 Cook Inlet communities to give citizens a visual understanding of their local watersheds, and to share Keeper's GIS mapping and water quality monitoring information. Since that time, Keeper has had several groups from throughout Cook Inlet request information and services to assist them with their efforts to understand their local watersheds.

PROJECT DESIGN

A. Objectives

The overall objectives of CEMP are to 1) inventory baseline water quality in the Cook Inlet Basin, 2) detect and report significant changes and track water quality trends, and 3) raise public awareness of the importance of water quality through hands on involvement. The proposed project has the following objectives:

1. Evaluate whether CEMP sampling frequency, sampling methods, water quality parameters, and site selection are effective at detecting significant change in water quality over time.
2. Generate recommendations for improvements to CEMP protocols to better represent water quality in the Cook Inlet, which will lead to more effective and scientifically defensible community monitoring efforts.

B. Methods

Keeper staff will analyze five years of data stored in the CEMP database using SPSS software to determine variability within sites, between sites, and over time. The statistical power of the sampling program to detect change will be determined using SamplePower 2.0 software.

The CEMP database consists of data collected from 1996 to 2001 at a total of 89 sites (47 estuarine, 42 freshwater) in the Kachemak Bay watershed. Surface water samples are taken at all monitoring stations monthly between September and April and twice monthly from May through August for a total of 16 sampling events per site per year. Primary parameters (water temperature, turbidity, pH, salinity, and dissolved oxygen) are measured using standard EPA-approved procedures and/or methods which are in use by established citizen volunteer monitoring programs (e.g. Friends of Casco Bay's Citizens Water Quality Monitoring Program, Texas Watch's Volunteer Environmental Monitoring Program). Methods for additional parameters (apparent color, conductivity, nitrate-nitrogen, ortho-phosphate, fecal and total coliform bacteria) are taken from the "Volunteer Estuary/Lake/River/Stream Monitoring: A Method's Manual" published by U.S. EPA.

All data are reviewed by Keeper's Research Coordinator to ensure they meet program data quality objectives. The data quality objectives and quality assurance procedures for this program have been designed to identify and correct problems in data collection and reporting. Should the results of quality assurance reviews indicate that the integrity of data are questionable and data quality objectives are not being met, the data are flagged as unacceptable for inclusion in the CEMP database. None of the suspect data will be included in the proposed data analysis.

The null hypothesis for the CEMP is that there will be no significant mean difference in water quality parameters over time. For the CEMP data to be sufficiently powerful enough to test this, Keeper needs to determine if 1) sample size for baseline data is adequate, 2) precision of CEMP methods are adequate, and 3) temporal and geographic coverage is adequate. The robustness of

the CEMP protocols to reject the null hypothesis will be analyzed with SPSS Base 10.1 for Windows and SamplePower 2.0 software.

Based on the results of the Power Analysis, recommendations to improve the CEMP protocols will be proposed and presented to the CEMP Technical Advisory Committee. These improvements will be disseminated to the Cook Inlet partners in a project report. Keeper will also convene an annual water quality conference among current and potential monitoring partners and agencies to communicate findings from the analysis and to facilitate CEMP planning and development.

C. Cooperating Agencies, Contract, and Other Agency Assistance

Cook Inlet Keeper is the only organization requesting funds for this project.

SCHEDULE

A. Measurable Project Tasks for FY 02 (October 1, 2001 – September 30, 2002)

October 2001 – July 2002:	Analyze CEMP data to determine effectiveness of protocols
August– September 2002:	Production and release of project report which will include recommendations for improvements to CEMP protocols
Ongoing:	Work with new potential partners to help them develop credible monitoring programs. Potential new partners include: Port Graham/Nanwalek Watershed Council, Ninilchik Native Association, Chikaloon Tribal Council
December 2002:	Convene meeting with current and potential monitoring partners and agencies to communicate findings from analysis
March 2003:	Incorporate suggestions into the CEMP Quality Assurance Project Plan
April 15, 2003:	Submit final report to EVOS (FY02)

B. Project Milestones and Endpoints

The first project objective, which is completion of data analysis, will be complete by July 31, 2002. Production/release of analysis report, project objective #2, will be complete by September 30, 2002. Implementation of suggestions for refinement to CEMP protocols generated from analysis and agreed upon by the Technical Advisory Committee and partner groups will occur during FY 2003 and are not part of the proposed project objectives.

C. Completion Date

All of the project objectives will be met by the end of FY 2002. The final project report will be submitted to EVOS Trustee Council by April 15, 2003.

PUBLICATIONS AND REPORTS

In October 2001, Keeper will released "Cook Inlet Citizens' Environmental Monitoring Project Annual Water Quality Status Report" which will present five-years of water quality data collected by volunteers in the Kachemak Bay watershed. As with previous annual reports, the October 2001 report will be distributed to concerned citizens, agency personnel, tribal councils, and the press. Previous annual reports are available on the Keeper's web page at http://www.inletkeeper.org/cemp/cempd1.asp.

In September 2002, Keeper will release the proposed project report: "Evaluating the Effectiveness of Citizen's Environmental Monitoring Project", which will be distributed to current and potential partner groups, agencies, and concerned citizens.

PROFESSIONAL CONFERENCES

No travel funds beyond the Trustee Council's Annual Restoration Workshop are budgeted for FY 2002

NORMAL AGENCY MANAGEMENT

Not applicable.

COORDINATION AND INTEGRATION OF RESTORATION EFFORTS

Cook Inlet Keeper has a close relationship with many of the restoration efforts that have been funded by the Trustees Council. Most notably, Keeper shared its *Cook Inlet GIS Atlas* on CD ROM and Annotated Bibliography to assist the Kachemak Bay National Estuarine Research Reserve's Ecological Characterization Project, and the Cook Inlet Information Monitoring and Management Systems database project. Keeper is linked to the CIIMMS web page, and once its water quality database and interactive GIS maps become available on the Internet, they will be integrated with the CIIMMS database. The information Keeper shares with CIIMMS contributes greatly to a more holistic understanding of Cook Inlet's resources, pollution sources, and other conditions.

Keeper is working with Kachemak Bay National Estuarine Research Reserve to bring together citizen volunteer monitors and professional researchers to deploy a systematic array of electronic sensors along the south and north sides of Kachemak Bay, which will coincide with volunteer water quality monitoring sites, to assess water circulation patterns throughout the Bay. Keeper also collaborates with UAA's Kachemak Bay Campus which makes an in-kind contribution of lab space for water quality laboratory analysis.

Keeper cooperates with agencies that conduct water quality monitoring in the Cook Inlet basin. These agencies include: U.S. Geological Survey, Alaska Department of Environmental Conservation, U.S. Environmental Protection Agency, National Oceanic and Atmospheric

Administration, Alaska Department of Fish and Game, Alaska Department of Natural Resources, and the Cook Inlet Regional Citizens Advisory Council. Representatives from each of these agencies participate as members of Keeper's TAC. Also, DNR's Division of Forestry invited Keeper to present its water quality information at a planning meeting to help it determine a need for monitoring forestry activities and impacts on the Kenai Peninsula, and the ADF&G has used Keeper's water quality reports to help guide their future plans for monitoring, so as not to duplicate existing efforts.

In addition to Trustees-funded Restoration Projects, Keeper collaborates with numerous other local and national groups and agencies. For example, Keeper is a partner in the Pratt Museum's Kachemak Bay Discovery Project, a member of the River Network and a member of the National Water Keeper Alliance. Keeper works closely with all monitoring efforts in Cook Inlet including those conducted by: the Anchorage Waterways Council, University of Alaska Anchorage's Environment and Natural Resources Institute, Wasilla and Homer Soil and Water Conservation Districts, Kenai Watershed Forum, Anchor Point Community Rivers Planning Coalition, Seldovia Oil Spill Response Team, and Port Graham/Nanwalek Watershed Council (memorandums of understanding attached). Keeper plans to include more partners in the future such as the Chickaloon Native Village, Ninilchik Traditional Council, Kenai National Wildlife Refuge, and more.

Cook Inlet Keeper's monitoring project has been funded through ADEC by EPA 319 nonpoint source grant money over the last three years, along with other sources to meet EPA's required 40% non-federal match. Keeper's other monitoring support has included grants from the Skaggs Foundation ($8,000 in 1999 and $5,000 in 2001), Norcross Wildlife Foundation ($10,000 in 1999 and $13,000 in 2001), River Network Watershed Assistance Grant ($20,000 in 1999), Bullitt Foundation ($10,000 in 2000), individuals and businesses (~$10,000/yr.) fees for GIS services (~$5,000/yr.), and in-kind contributions of time and services (~$25,000/yr.).

Keeper's monitoring budget for FY 02 is $205,313. Keeper anticipates a few more years of funding from EPA, including $105,000 in FY 02. Keeper will raise additional funding including grants, individuals, businesses and fees for services. Keeper currently has a grant pending with

the U.S. Fish and Wildlife Foundation. Keeper is also exploring the feasibility of a business fundraising effort to solicit businesses to adopt monitoring sites for the cost of sampling equipment needed to monitor that site for one year.

Keeper is requesting $15,000 from EVOS for FY 02 to cover Keeper staff time and office supplies to perform the needed analysis, which will ensure the consistency and credibility of citizen-based monitoring in Alaska. Funding from EVOS will also help Keeper make citizen-collected data more useful to scientists and to make the data available for public access. This project will provide agencies and the public with the information needed to better understand threats to, and solutions for coastal resources, and will lead to improved stewardship and coastal watershed and wildlife habitat protection in Alaska.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

Not applicable.

PROPOSED PRINCIPAL INVESTIGATOR IF KNOWN

Name:	Sue Mauger, Stream Ecologist
Affiliation:	Cook Inlet Keeper
Mailing Address:	PO Box 3269, Homer, Alaska 99603
Phone number:	(907) 235-4068
Fax number:	(907) 235-4069
E-mail Address:	sue@inletkeeper.org

PRINCIPAL INVESTIGATOR

Sue Mauger has taken over the helm from Beth Lambert as the Stream Ecologist for the Lower Kenai Peninsula Watershed Health Project at Cook Inlet Keeper. Sue joins the staff in Homer after completing a Masters in Fisheries Science at Oregon State University. Sue also has a B.S. in zoology from Duke University and worked in the Chesapeake Bay studying Blue Crabs and coordinated research projects for Earthwatch Institute in Massachusetts. Sue switched coasts in 1994 and became director of the volunteer monitoring project for the Xerces Society in Portland, Oregon. She worked with high school students and local citizens to develop benthic invertebrate monitoring programs in watershed along the Oregon coast.

OTHER KEY PERSONNEL

Joel Cooper, Research Coordinator

Joel joined Keeper's staff in 1998 to coordinate and oversee Keeper's citizen water quality monitoring program. Prior to joining Keeper, some of Joel's work experience included conducting stream surveys for the U.S. Forest Service, serving as an Organic Chemist for the Rocky Mountain Analytical Laboratory, and working as Environmental Scientist for the Southern Illinois University Department of Pollution Control. With a B.S. in Environmental Studies focusing on forestry, plant and soil sciences from Southern Illinois University, and with considerable sampling and monitoring experience with the U.S. Fish & Wildlife Service, National Park Service and the U.S. Forest Service, Joel is well-qualified to coordinate Keeper's water quality monitoring efforts.

Mike Gracz, Geographic Information System (GIS) Specialist

Mike is a forest ecologist with degrees from State University of New York College of Environmental Science & Forestry (B.S.) and the University of Washington (M.S.). He has backgrounds in computer mapping technologies, forest disturbance ecology and botany. Prior to joining Keeper in 1997, Mike worked for the Kenai National Wildlife Refuge, Alaska Maritime National Wildlife Refuge, and Olympic National Park.

ATTACHMENTS

(one copy each)

GIS Map - Citizen-based Monitoring in Cook Inlet

Technical Advisory Committee and Citizen Advisory Panel lists

Citizen-based Monitoring Support Services

Memoranda of Understanding - between Cook Inlet Keeper and:

- Anchorage Waterways Council
- UAA's Environment and Natural Resources Institute
- Wasilla Soil and Water Conservation District

Letters of Support

- Anchorage Waterways Council
- Kenai Watershed Forum
- Native Village of Port Graham
- ADEC Watershed Management Quality Assurance Project Officer 2000

*Copies of EPA and ADEC-approved Quality Assurance Project Plan and Volunteer Training Manual are available for review upon request. The documents are also available for download on Keeper's web page at www.inletkeeper.org.

EVOS Tr es Council

Budget Form

October 1, 2001 - September 30, 2002

Budget Category:	Authorized FY 2001	Proposed FY 2002	LONG RANGE FUNDING REQUIREMENTS					
Personnel		$11.0						
Travel		$0.5						
Contractual		$1.6						
Commodities		$0.1						
Equipment		$2.0						
Subtotal		$15.2	Estimated FY 2003					
Indirect		$1.52						
Project Total		$16.7						
Full-time Equivalents (FTE)		3.9						
	Dollar amounts are shown in thousands of dollars.							
Other Funds								

Cook Inlet Keeper is requesting the full $16,700 for this one-year project from the EVOS Trustees Council.

FY 02

Project Number: 02667

Project Title: Effectiveness Of Citizens' Environmental Monitoring Program

Agency: Cook Inlet Keeper

FORM 4A Non Trustee SUMMARY

Prepared:

12-Apr-00

EVOS Tr[illegible]es Council

Budget Form

October 1, 2001 - September 30, 2002

Personnel Costs:			Months	Monthly		Proposed
	Name	Position Description	Budgeted	Costs	Overtime	FY 2001
	S. Mauger	Stream Ecologist	3.0	2.8		8.4
	J. Cooper	Research Coordinator	0.8	2.9		2.3
	M. Gracz	GIS/Web Specialist	0.1	3.0		0.3
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	3.9	8.7	0.0	
					Personnel Total	$11.0

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FY 2001
	1 - RT Homer to Anchorage - Annual Restoration Workshop	0.17	1	2	0.05	0.3
	1 Rental Car - 2 days for Annual Restoration Workshop ($50/day)					0.1
	Accommodation 2 nights - Annual Restoration Workshop ($50/day)					0.1
						0.0
						0.0
						0.0
						0.0
					Travel Total	$0.5

FY 02

Prepared:
12-Apr-00

Project Number:
Project Title: Effectiveness Of Citizens' Environmental Monitoring Program
Agency: Cook Inlet Keeper

FORM 4B
Personnel
& Travel
DETAIL

EVOS Tr[illegible]es Council

Budget Form

October 1, 2001 - September 30, 2002

Contractual Costs:	Proposed
Description	FY 2001
Communications (phone, fax, email) with TAC, other monitoring groups, etc.	0.5
Postage	0.1
Printing/copying of final report	1.0
Contractual Total	$1.6

Commodities Costs:	Proposed
Description	FY 2001
Supplies	0.1
Commodities Total	$0.1

FY 02

Prepared:
12-Apr-00

Project Number:
Project Title: Effectiveness Of Citizens' Environmental Monitoring Program
Agency: Cook Inlet Keeper

FORM 4B
Contractual & Commodities DETAIL

EVOS Tr es Council

Budget Form

October 1, 2001 - September 30, 2002

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2001
SPSS Base 10.1 Software for Windows	1	1.0	1.0
Sample Power 2.0	1	1.0	1.0
			0.0
			0.0
			0.0
			0.0
			0.0
Indicate replacement equipment with an R.		**New Equipment Total**	$2.0

Existing Equipment Usage:	Number	
Description	of Units	
19' patrol skiff	1	
36' research vessel	1	
Computers	8	
Printers	2	
GIS Map Plotter	1	
Xerox machine	1	
monitoring kits	41	
monitoring meters	5	

FY 01

Project Number:
Project Title: A Prototype Citizen-based Monitoring and Watershed Assessment
Agency: Cook Inlet Keeper

FORM 4B
Equipment
DETAIL

Prepared:
12-Apr-00

Project Title: **Developing an Interactive Water Quality and Habitat Database and Making it Accessible on the Web**

Project Number:	02668
Restoration Category:	Monitoring
Proposer:	Cook Inlet Keeper
Lead Trustee Agency:	Not Known
Cooperating Agencies:	Other database committee members include: Alaska Department of Environmental Conservation, UAA's Environment and Natural Resource Institute, Mat-Su Borough, Anchorage Waterways Council, Wasilla Soil and Water Conservation District, Homer Soil and Water Conservation District, and the Kenai Watershed Forum
Alaska SeaLife Center:	No
Duration:	1-year request for funding
Cost FY 02:	$15,000 (out of estimated $79,500 budget)
Geographic Area:	Cook Inlet basin
Injured Resources/Service:	This project will result in direct and indirect benefits to all injured resources and lost or reduced services located in the Cook Inlet basin.

ABSTRACT

The project partners have come together to form a database committee to create a consistent data management system where all citizen groups and agencies can equally share, report and review their water quality and habitat data. The committee's objective is to make data more accessible and more useful to decision makers, stakeholders, resource managers, and the public. The committee will uplink a shared interactive database on the Internet where it can be viewed and queried with GIS watershed maps, photos and graphs so that it is user-friendly, educational and meaningful. Access to this data will help facilitate a better understanding about threats to, and solutions for, water quality and habitat.

INTRODUCTION

Cook Inlet Keeper and its partner groups are requesting one year of funding from the Exxon Valdez Oil Spill Trustees Council through the Ecosystem Synthesis/GEM Transition: Improving accessibility of research results. This project will establish a unified water quality and habitat database and make it accessible on the Internet where it can be viewed and queried with GIS maps, photos and graphs in a user-friendly and meaningful way.

Cook Inlet Keeper was the first community-based group in Alaska to implement a credible Citizen Environmental Monitoring Program founded on U.S. Environmental Protection Agency- and Alaska Department of Environmental Conservation-approved methods. In 1996, Keeper convened a Technical Advisory Committee comprised of water quality professionals, and began to train volunteers to monitor water quality and habitat in and around Kachemak Bay. As part of its monitoring work, Keeper created Alaska's first EPA- and ADEC-approved Quality Assurance Project Plans and Volunteer Manual which assure scientific credibility of citizen-collected data.

As a result of its successes, Keeper has moved into a Quality Assurance Agent role to guide and support other Cook Inlet communities in their efforts to establish similar monitoring programs. Keeper works with the Kenai Watershed Forum to support citizen-based monitoring of the Kenai River, and with UAA's Environment and Natural Resource Institute, the Anchorage Waterways Council, and the Wasilla Soil and Water Conservation District through formal Memoranda of Understanding to facilitate volunteer monitoring in the Anchorage Bowl and the Mat-Su Valley. Keeper also networks with Anchor Point's Community Rivers Planning Coalition, Seldovia Oil Spill Response Team, Ninilchik Traditional Council, and Port Graham/Nanwalek Watershed Council on monitoring projects in Kachemak Bay and on lower Kenai Peninsula salmon streams.

In December 2000, Keeper organized the first annual full-day monitoring partner group meeting in Anchorage. The purpose of the meeting was to link current and potential monitoring groups and agencies together to coordinate efforts, build credibility, and exchange information and ideas. This meeting was well attended by over 26 professionals representing 14 different organizations and agencies including: Cook Inlet Keeper, Homer Soil and Water Conservation District, Anchorage Waterways Council, Kenai Watershed Forum, Wasilla Soil and Water Conservation District, Port Graham/Nanwalek Watershed Council, University of Alaska Anchorage's Environment and Natural Resource Institute, Alaska Department of Environmental Conservation's (ADEC) Nonpoint Source Program, U.S. Geological Survey (USGS), U.S. Fish and Wildlife Kenai National Wildlife Refuge, Environmental Protection Agency (EPA), *Exxon Valdez* Oil Spill Trustees Council, and Cook Inlet Information Management and Monitoring System. The meeting included discussions of quality control procedures, volunteer and equipment management, and data management and accessibility.

To tackle the questions of data management and accessibility, a database committee was formed composed of Cook Inlet Keeper, Alaska Department of Environmental Conservation, UAA's Environment and Natural Resource Institute, Mat-Su Borough, Anchorage Waterways Council, Wasilla and Homer Soil and Water Conservation Districts, and the Kenai Watershed Forum. The committee is working on the following three objectives: 1) create a consistent data management system where all citizen groups and agencies can equally share, report and review

their water quality and habitat data; 2) interface citizen-collected data with EPA's STORET to make it more useful to agencies; and 3) make habitat and water quality data accessible on the Internet in a user-friendly, interactive format with links to GIS watershed maps, photos and graphs.

All citizen-based monitoring groups in Cook Inlet will be using the same database, leading to the most complete and comprehensive water quality database in Alaska. By linking this information to the Internet, this project will provide agencies and the public with the information needed to make more informed decision on resource management and water quality and habitat protection in Alaska.

NEED FOR THE PROJECT

A. Statement of Problem

The Cook Inlet watershed was hit hard by the *Exxon Valdez* oil spill. The currents in the Gulf of Alaska caused oil to move up into Cook Inlet, along the Kenai Peninsula and back down the Alaska Peninsula, soaking much of the shoreline and ocean floor with crude oil. As a result, many of Cook Inlet's coastal resources, and the services which they support, were impacted.

Although some recovery has occurred, Cook Inlet's sensitive resources face ongoing threats from a host of unsustainable activities, including rapid filling of wetlands; additional oil spills from an aging oil and gas infrastructure; discharge of pollutants from industrial activities; and increased nonpoint runoff from population growth and sprawl. Approximately 400,000 people, nearly 2/3 of Alaska's population, live in the vast Cook Inlet watershed, and a population increase of 600% over the past thirty years has substantially magnified pressures on Cook Inlet's sensitive resources.

Because of the rapid changes taking place in Southcentral Alaska, it is essential that we invest in long-term monitoring now before further impacts have occurred. The baseline information collected from monitoring will provide a benchmark for measuring future changes in water quality and habitat, a basis for developing and implementing best management practices and pollution prevention techniques.

As state and federal budgets for monitoring continue to decline, agencies rely heavily on other sources of monitoring information. In recent years, citizens have stepped in to fill this important role to gauge the health of our viable yet stressed public resources. Since 1998, Cook Inlet Keeper has been working with other groups to collect water quality and habitat information for the Cook Inlet watershed. Keeper is now ready to synthesize this information and make it more accessible to agencies, decision makers and the public to help facilitate a greater understanding about threats to, and opportunities for, water quality and habitat.

B. Rationale/Link to Restoration

The Cook Inlet watershed supports a rich fabric of life, including sea otters, harbor seal, orca whales, several species of waterfowl, diverse intertidal and subtidal communities, and all five species of wild Pacific salmon. Healthy coastal resources are critical to the economic and social wellbeing of Cook Inlet communities. One of the challenges in the efforts to restore the environment following the *Exxon Valdez* oil spill has been the lack of adequate data describing conditions prior to the spill. It is essential that monitoring take place in Cook Inlet now, before more impacts are realized, so that reference conditions can be established from which to notice changes. Yet, state and federal agencies responsible for water quality monitoring are strapped by budget cuts, and unable to collect the water quality information needed to ensure compliance with state and federal water quality standards.

Citizens care about water quality and habitat, and want to participate in efforts to understand their watersheds. Several Cook Inlet communities have already begun to organize to protect local habitat and water quality. Many of these efforts, however, begin without knowing what resources are available, or what other groups are working toward similar goals.

By improving access to habitat and water quality information, this project will help improve our understanding of water quality and habitat, enhance watershed stewardship among citizens, and provide decision makers, agencies and communities with the tools they need to manage human uses and reduce pollution. As a result, this project will improve the rate of natural resource recovery in the Cook Inlet watershed and help prevent future harms from occurring.

C. Location

Keeper's Citizens' Environmental Monitoring Program takes place in the Cook Inlet basin, which covers 47,000 square miles of terrestrial, coastal and marine habitat in Southcentral Alaska. Communities involved in and affected by the project include Anchorage, Palmer, Wasilla, Kenai, Soldotna, Ninilchik, Anchor Point, Homer, Seldovia, Port Graham, and Nanwalek. Other communities which may play more of a role in the project in the future include: Talkeetna, Willow, Knik, Chickaloon, Eklutna, Eagle River, Girdwood, Cooper Landing, Nikiski, Tyonek and others. Although this project currently focuses within the geographic boundaries of the Cook Inlet watershed, the online, interactive database is being used as a prototype for the State and will eventually evolve into a clearinghouse for Alaska-wide water quality data.

COMMUNITY INVOLVEMENT AND TRADTIONAL KNOWLEDGE

Citizen-based monitoring is a community-owned and community-driven effort. It is a highly effective way to bridge the gap between citizens and natural resource agencies. Citizens are directly involved in collecting and tracking water quality information, and have a greater sense of ownership of the monitoring findings.

Citizen monitoring is also an important way to integrate traditional environmental knowledge (TEK) with science. Many of the citizens who become involved in the monitoring efforts have a long history with their local regions; and during that time, have observed environmental changes. Visual and other observations through narration, photographs and sketches are one way that TEK

is incorporated, and Keeper continues to strengthen TEK components of citizen-based monitoring.

This project will further community involvement in the Citizen Environmental Monitoring Program by providing communities with greater access to monitoring result and translating it in visual ways which are educational and meaningful. Audiences which may find particular use for monitoring data include community planners, local and Tribal governments, commercial and sport fishermen, university personnel and students, environmental consultants, decision makers, and resource agencies such as Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, U.S. Geological Service, and others. This project will create a database where citizen information, including Traditional Environmental Knowledge, is shared so that it can be compared to agency science, and help facilitate an exchange of information and ideas about habitat and water quality.

PROJECT DESIGN

A. Objectives

The overall goal of this project is to make data more accessible and more useful to decision makers, stakeholders, resource managers, and the public. The objectives include:

1) Create a consistent data management system where all citizen groups and agencies can equally share, report and review their water quality and habitat data;

2) Interface citizen-collected data with EPA's STORET to make it more useful to agencies; and

3) Make habitat and water quality data accessible on the Internet in a user-friendly, interactive format with links to GIS maps, photos and graphs.

B. Methods

The database committee has identified the following priorities for a consistent data management and reporting system:

1. move data in a simple and easy way;
2. make data available to the public on the Internet in an educational and meaningful way with links to charts, watershed maps and photos;
3. interface data with EPA's STORET water quality database so that it is more useful to scientists and resource managers;
4. allow for local groups to view their own data once it is entered;
5. create a way for local groups to compare their data with data from other citizen monitoring partners and with agencies;
6. allow local groups to view water quality data from any source which is relevant to their area of interest;
7. include database securities protocols that are appropriate for the web; and

8. allow for a database system which opens up a wider variety of water quality and habitat parameters and methods.

The committee has identified model programs for guidance. Specifically, the partners are looking at the IOWATER (www.iowater.net) program as an exciting prototype for its on-line interactive database. The partners also realize there are other existing systems of Alaska data that they can use to help build a unified database – those include: 1) Keeper's Access database which is used by Keeper, Kenai Watershed Forum, Wasilla Soil and Water Conservation District, and Anchorage Waterways Council; 2) CIIMMS database; 3) Mat-Su Borough Lake data which is under development; 4) ENRI's EDAS access database which is for professional-level aquatic macroinvertebrate data; 5) ENRI's Educational database which is purely educational and being developed for web application; 6) EPA's STORET which is the national water quality database clearinghouse for all EPA-funded projects; 7) USGS's NWIS for professional USGS-collected data; and 8) Anchorage Municipality Water quality database.

The database committee is considering two possible directions: 1) use, maintain and continue to develop Cook Inlet Keeper's Access database, and interface this data with Internet in ways that meet needs and interests of citizen-based groups and then export data from the Access database into STORET to meet research needs and goals; OR 2) enter data directly into STORET through an interface module and then extract the data for local needs through a data-download or through the EPA developed report application for uplink to the Internet with links to maps, graphs and photos.

ADEC is currently performing an analysis of the proposed STORET data sources with special attention to required STORET fields and rules. Simultaneously, ADEC is looking at other possible database scenarios. This analysis will be complete in early fall 2001, at which point the project partners will be well positioned to move forward with the project objectives. This timing will work nicely with the EVOS funding schedule.

In the fall of 2001, the partners will be ready to contract with a database specialist to help the committee implement the interface and output that best meets their database priorities and objectives. A $15,000 grant from the *Exxon Valdez Oil Spill* Trustees Council will provide the partners with the funds they need to make this essential data compilation and dissemination project a success. Support from the Trustees will result in the most coordinated, credible and consistent water quality data management system in Alaska where citizens and agencies can equally share, report and review water quality and habitat information.

Although this project currently focuses within the geographic boundaries of the Cook Inlet watershed, this database will be used as a prototype for the State and will eventually evolve into a clearinghouse for Alaska-wide volunteer-collected water quality and habitat data. This project will result in essential compilation and analysis of citizen-collected data, and make this information more accessible to agencies and the public. By improving access to monitoring results, this project will help improve our understanding of water quality and habitat, enhance watershed stewardship among citizens, and provide decision makers, agencies and communities with the tools they need to management and protect our natural resources.

C. Cooperating Agencies, Contracts and Other Agency Assistance

The database committee is composed of the various agencies and groups who participate in citizen-based monitoring and have a vested interested in getting a shared database on the Internet. These groups include:

Alaska Department of Environmental Conservation – ADEC is the primary funder of citizen-based monitoring programs in Alaska and is collaborating closely with monitoring groups to make their data more useful to agencies and more accessible to the public. ADEC is working with the committee to determine the best ways citizen-collected data can be interfaced with EPA's STORET, so that Alaska's data can be compared with water quality information from throughout the Nation. CIIMMS is working closely with ADEC in this role.

UAA's Environment and Natural Resource Institute: ENRI serves on the database committee and is working to link macroinvertebrate monitoring data to the database. This and other biological monitoring data are key to understanding habitat issues related to water quality.

Mat-Su Borough: The Borough coordinates a citizen-based Lake's Monitoring Program in the Mat-Su Valley. Currently there is little interface between lake monitoring and stream and estuarine monitoring. The Mat-Su Borough is working with the database committee to expand the parameters and the methods in the shared database so that it is compatible with lake monitoring.

Anchorage Waterways Council, Wasilla Soil and Water Conservation District, Homer Soil and Water Conservation District, and Kenai Watershed Forum: These four groups oversee community-based water quality monitoring efforts in their local areas, and currently share the same Quality Assurance protocols, methods and database. They are working with the database committee to determine ways to incorporate other methods and parameters in the database to make it more comprehensive of water quality and habitat information, and to link the database on the Internet to improve the exchange and review of data among and between the partner group.

Cook Inlet Keeper: Cook Inlet Keeper coordinates citizen-based monitoring on the lower Kenai Peninsula. Furthermore, Keeper serves as the Quality Assurance Agent to oversee the quality performance of other citizen-based monitoring efforts in the Cook Inlet watershed. Keeper has played a key role in pulling various citizen and agency groups together to facilitate the exchange of information and ideas and is taking a lead in facilitating the database committee in meeting its objective.

SCHEDULE

A. Measurable Project Tasks for FY 02 (October 1, 2001 – September 30, 2002)

October 1:	Contract with database and web specialist
October 15:	Determine best data system that allows for all parameters and methods and meets committee's database priorities

	and meets committee's database priorities
November 1:	Identify and create GIS maps and graphs to link with database
December 1:	Create interface between database, GIS and the Internet
January 14-23:	Attend annual restoration workshop
February 1:	Establish securities for database access on the web
March 1:	Formalize Standard Operative Procedures for quality oversight of database use and data management
May 1:	Uplink database on the web and conduct press and other outreach to key audiences to announce its availability
May 1:	Oversee use of the database by monitoring partner groups as a way to enter and manage their habitat and water quality data
July 1:	Evaluate product and plan accordingly
August 1:	Update and maintain web page
April 13, 2003:	Submit annual report

B. Project Milestones and Endpoints

Fulfillment of project objectives will be measured by the following milestones:

1. Database system in place where all citizen groups can equally share, report and review water quality data (May 2002)
2. Citizen-collected data uplinked to EPA's STORET (December 2001)
3. Interactive database accessible on the internet with links to maps, photos and graphs (July 2002)
4. Final Report on project to EVOS Trustees Council (April 15, 2003)

C. Completion Date

This database and Internet product will be complete by September 30, 2002. The final report for EVOS Trustees Council will be complete by April 15, 2003.

PUBLICATIONS AND REPORTS

In October 2001, Keeper will released "Cook Inlet Citizens' Environmental Monitoring Project Annual Water Quality Status Report" which will present five-years of water quality data collected by volunteers in the Kachemak Bay watershed. As with previous annual reports, the October 2001 report will be distributed to concerned citizens, agency personnel, tribal councils, and the press. Previous annual reports are available on the Keeper's web page at http://www.inletkeeper.org/ccmp/ccmpd1.asp.

PROFESSIONAL CONFERENCES

Cook Inlet Keeper is not requesting any EVOS funds for professional conferences.

NORMAL AGENCY MANAGEMENT

Not applicable.

COORDINATION AND INTEGRATION OF RESTORATION EFFORTS

Cook Inlet Keeper has a close relationship with many of the restoration efforts that have been funded by the Trustees Council. Most notably, Keeper shared its *Cook Inlet GIS Atlas* on CD ROM and Annotated Bibliography to assist the Kachemak Bay National Estuarine Research Reserve's Ecological Characterization Project, and the Cook Inlet Information Monitoring and Management Systems database project. Keeper is linked to the CIIMMS web page, and once its water quality database and interactive GIS maps become available on the Internet, they will be integrated with the CIIMMS database. The information Keeper shares with CIIMMS contributes greatly to a more holistic understanding of Cook Inlet's resources, pollution sources, and other conditions.

Keeper is working with Kachemak Bay National Estuarine Research Reserve to bring together citizen volunteer monitors and professional researchers to deploy a systematic array of electronic sensors along the south and north sides of Kachemak Bay, which will coincide with volunteer water quality monitoring sites, to assess water circulation patterns throughout the Bay. Keeper also collaborates with UAA's Kachemak Bay Campus which makes an in-kind contribution of lab space for water quality laboratory analysis.

Keeper cooperates with agencies that conduct water quality monitoring in the Cook Inlet basin. These agencies include: U.S. Geological Survey, Alaska Department of Environmental Conservation, U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, Alaska Department of Fish and Game, Alaska Department of Natural Resources, and the Cook Inlet Regional Citizens Advisory Council. Representatives from each of these agencies participate as members of Keeper's TAC.

In addition to Trustees-funded Restoration Projects, Keeper collaborates with numerous other local and national groups and agencies. For example, Keeper is a partner in the Pratt Museum's Kachemak Bay Discovery Project, a member of the River Network and a member of the National Water Keeper Alliance.

Cook Inlet Keeper's monitoring project has been funded through ADEC by EPA 319 nonpoint source grant money over the last three years, along with other sources to meet EPA's required 40% non-federal match. Keeper's other monitoring support has included grants from the Skaggs Foundation ($8,000 in 1999 and $5,000 in 2001), Norcross Wildlife Foundation ($10,000 in 1999 and $13,000 in 2001), River Network Watershed Assistance Grant ($20,000 in 1999), Bullitt Foundation ($10,000 in 2000), individuals and businesses (~$10,000/yr.) fees for GIS services (~$5,000/yr.), and in-kind contributions of time and services (~$25,000/yr.).

Keeper's monitoring budget for FY 02 is $205,313. Keeper anticipates a few more years of funding from EPA, including $105,000 in FY 02. Keeper will raise additional funding from other grants, individuals, businesses and fees for services.

Funding from EVOS will help Keeper make citizen-collected data more useful to scientists and to make the data readily accessible to decision makers, stakeholders, resource managers, and the public. This project will provide agencies and the public with the information needed to better understand threats to, and solutions for coastal resources, and will lead to improved stewardship and coastal watershed and wildlife habitat protection in Alaska.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

Not applicable.

PROPOSED PRINCIPAL INVESTIGATOR IF KNOWN

Name:	Joel Cooper, Research Coordinator
Affiliation:	Cook Inlet Keeper
Mailing Address:	PO Box 3269, Homer, Alaska 99603
Phone number:	(907) 235-4068
Fax number:	(907) 235-4069
E-mail Address:	joel@inletkeeper.org

PRINCIPAL INVESTIGATOR

Joel joined Cook Inlet Keeper's staff in 1998 to implement a professional-level monitoring program on lower Kenai Peninsula Salmon Streams. Later that year, Joel moved to Keeper's Citizens' Environmental Monitoring Program to coordinate and oversee citizen water quality monitoring in Kachemak Bay. Prior to joining Keeper, some of Joel's work experience included conducting stream surveys for the U.S. Forest Service, serving as an Organic Chemist for the Rocky Mountain Analytical Laboratory, and working as Environmental Scientist for the Southern Illinois University Department of Pollution Control. Joel has a B.S. in Environmental Studies focusing on forestry, plant and soil sciences from Southern Illinois University, and considerable sampling and monitoring experience with the U.S. Fish & Wildlife Service, National Park Service and the U.S. Forest Service.

OTHER KEY PERSONNEL

Jeff Hock, Database Chief – Alaska Department of Environmental Conservation
Russell Kunibe, Analyst Programmer – Alaska Department of Environmental Conservation
Elaine Major, Research Associate – UAA's Environment and Natural Resource Institute
Harry Banks, Program Analyst – Mat-Su Borough Planning Department
Dan Bogan, Volunteer Coordinator – Anchorage Waterways Council
Laura Eldred, Program Director – Wasilla Soil and Water Conservation District
Robert Ruffner, Program Director – Kenai Watershed Forum
Shirley Schollenberg, Program Director – Homer Soil and Water Conservation District

ATTACHMENTS
(one copy each)

Database Committee List

EVOS Tr es Council
Budget Form
October 1, 2001 - September 30, 2002

Budget Category:	Authorized FY 2001	Proposed FY 2002
Personnel		$19.2
Travel		$0.9
Contractual		$42.1
Commodities		$0.1
Equipment		$10.0
Subtotal		$72.3
Indirect		$7.23
Project Total		$79.5
Full-time Equivalents (FTE)		6.0
Other Funds		$64.5

LONG RANGE FUNDING REQUIREMENTS					
Estimated FY 2003					

Dollar amounts are shown in thousands of dollars.

The project partners are requesting $15,000 from the Exxon Valdez Oil Spill Trustees Council. The additional $64,500 has already been secured as either in-kind or monetary match. The match includes: 16,700 of personnel which is primarily the time of committee members valued at $20/hour X 80 hours/member; 400 in travel to database committee meetings; 32,100 in contractual which includes ADEC contract to perform an analysis of STORET and the partners' contract for a database/web specialist to fulfill the project objectives; 10,000 in equipment for any necessary computer software; and 5,330 in administrative costs. The partners are requesting the following from EVOS: 2,500 in personnel to oversee committee and contracts; 500 in travel for EVOS annual workshop; 10,000 for contract to database/web specialist; 100 for supplies and 1,900 for administrative overhead.

FY 02

Prepared:
12-Apr-00

Project Number: 02668
Project Title: Developing an Interactive Water Quality and Habitat Database and Making it Accessible on the Web
Agency: Cook Inlet Keeper

FORM 4A Non Trustee SUMMARY

EVOS Tr es Council
Budget Form
October 1, 2001 - September 30, 2002

Personnel Costs:			Months	Monthly		Proposed
	Name	Position Description	Budgeted	Costs	Overtime	FY 2001
	J. Cooper - Keeper	Research Coordinator	1.0	3.2		3.2
	J. Hock - ADEC	Database Chief	0.5	3.2		1.6
	R. Kunibe - ADEC	Analyst Programmer	1.0	3.2		3.2
	C. Fries - CIIMMS	Director	0.5	3.2		1.6
	E. Major - ENRI	Research Associate	0.5	3.2		1.6
	H. Banks - M-S Borough	Planning Department	0.5	3.2		1.6
	D. Bogan - AWC	Monitoring Coordinator	0.5	3.2		1.6
	L. Eldred - WSWCD	Program Director	0.5	3.2		1.6
	R.Ruffner- KWF	Program Director	0.5	3.2		1.6
	S. Schollenberg - HSWCD	Program Director	0.5	3.2		1.6
						0.0
						0.0
		Subtotal	6.0	32.0	0.0	
					Personnel Total	$19.2

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FY 2001
	1 - RT Homer to Anchorage - Annual Restoration Workshop	0.17	1	2	0.05	0.3
	1 Rental Car - 2 days for Annual Restoration Workshop ($50/day)					0.1
	Accommodation 2 nights - Annual Restoration Workshop ($50/day)					0.1
	1 - RT Homer to Anchorage for database committee meeting	0.17	1	1	0.05	0.2
	1 - RT Kenai to Anchorage for database committee meeting	0.12	1	1	0.05	0.2
						0.0
						0.0
					Travel Total	$0.9

FY 02

Prepared:
12-Apr-00

Project Number:
Project Title: Developing an Interactive Water Quality and Habitat Database and Making it Accessible on the Web
Agency: Cook Inlet Keeper

FORM 4B
Personnel
& Travel
DETAIL

EVOS Tr es Council
Budget Form
October 1, 2001 - September 30, 2002

Contractual Costs:	Proposed
Description	FY 2001
Teleconferences for database committee	1.5
Other Communications (phone, fax, email)	0.1
Contract for database design, interface with GIS and web, and interface with STORET	40.5
Contractual Total	$42.1

Commodities Costs:	Proposed
Description	FY 2001
Supplies	0.1
Commodities Total	$0.1

FY 02

Prepared:
12-Apr-00

Project Number:
Project Title: Developing an Interactive Water Quality and Habitat Database and Making it Accessible on the Web
Agency: Cook Inlet Keeper

FORM 4B
Contractual & Commodities DETAIL

EVOS Tr es Council

Budget Form

October 1, 2001 - September 30, 2002

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2001
Internet/Database/GIS interfacing software like Internet Map Server	1	10.0	10.0
			0.0
			0.0
			0.0
			0.0
			0.0
Indicate replacement equipment with an R.		**New Equipment Total**	$10.0

Existing Equipment Usage: Description	Number of Units	

FY 01

Project Number:
Project Title: Developing an Interactive Water Quality and Habitat Database and Making it Accessible on the Web
Agency: Cook Inlet Keeper

FORM 4B
Equipment
DETAIL

Prepared:
12-Apr-00

Hooligan Research

Project Number:	02669
Restoration Category:	Enhance/Replace Subsistence Resources
Proposer:	Native Village of Eyak
Lead Trustee Agency:	Native Village of Eyak, a Federally Recognized Tribal Government.
Cooperating Agencies:	DOI, ADFG, NMFS, & CRRC.
Duration:	1st year of a two-year project.
Cost FY 02:	$100,000
Cost FY 03:	$100,000
Geographic area:	Copper River
Injured Resource/Service	Subsistence

Abstract:

The Alaska Department of Fish and Game (ADFG) has been selling permits to harvest hooligan commercially for the past two years. They are doing this to get funding to do research on hooligan. We are concerned because they cannot tell us what the biomass is. Hooligan are a Traditional Subsistence food for our Tribe and have been for centuries. They are also a forage food for all the birds, fishes and marine mammals. Steller Sea Lions have been placed on the endangered list. This is part of their diet. There have been no commercial herring openers in years, because they have been over fished. It doesn't make sense to start a commercial fishery on hooligan, when the commercial fishery on herring resulted in the depletion of those stocks. We need funding to do some independent research on hooligan to see if it can sustain a commercial harvest and still maintain the stocks for Traditional Subsistence Harvest.

The Native Village of Eyak

P.O. Box 1388
Cordova, Alaska 99574-1388
PH (907) 424-7738 * FAX (907) 424-7739

April 13, 2001

Molly McCammon
Executive Director
Exxon Valdez Oil Spill Trustees Council
645 G Street, Suite 401
Anchorage, Alaska 99501-3451

Dear Molly

Enclosed is a restoration proposal to do research on the hooligan stocks in the Copper and Bering River Deltas. The ADFG has been selling permits to do commercial harvests of Hooligan on the Copper River Delta for the past two years. Because of budget cuts they need these funds to do research. As Hooligan has been a Traditional Subsistence food we have protested this harvest to no avail. They have never been able to tell us what the biomass is.

The Native Village of Eyak is very concerned about this commercial harvest of Hooligan.

We are requesting technical assistance from EVOS for this proposal.

Sincerely yours

Bob Henrichs
President
Native Village of Eyak
Traditional Council

Project Title: Coordinating Volunteer Vessels of Opportunity to Collect Oceanographic Data in Kachemak Bay and Lower Cook Inlet, submitted under the BAA

Project Number:	02671-BAA
Restoration Category:	Research and Monitoring
Proposer:	Cook Inlet Keeper, Kachemak Bay Research Reserve
Lead Trustee Agency:	ADFG(requested)
Alaska SeaLife Center:	No
Duration:	1st year, 1 year project
Cost FY02:	$49.6
Geographic Area:	Kachemak Bay/Lower Cook Inlet
Injured Resource/Service:	Subtidal and intertidal communities, sediments, mussels, clams, archeological resources

ABSTRACT

Cook Inlet Keeper and the Kachemak Bay Research Reserve will coordinate the collection of oceanographic data from ships of opportunity and with extensive local community involvement. Instruments installed on charter boats will be used to collect time-series of temperature and salinity from transects along Kachemak Bay. Drift cards will be deployed seasonally at locations surrounding the region. Collected data will be used to infer regional water circulation and mixing characteristics. These data will also be correlated with existing stationary sensors and volunteer-monitoring projects to expand spatial and temporal knowledge of water quality and mixing patterns and their relationship to the dispersal of larvae and pollutants in the region.

INTRODUCTION

Cook Inlet Keeper and the Kachemak Bay Research Reserve are requesting one year of funding from the *Exxon Valdez* Oil Spill Trustees Council through the Ecosystem Synthesis/GEM Transition: Innovative Tools and Strategies to Improve Monitoring. We propose to coordinate the oceanographic data needs of the Kachemak Bay Research Reserve with the volunteer program organized by the Cook Inlet Keeper. Community volunteers have expressed interest in providing vessels as platforms to collect basic time-series of temperature and salinity in Kachemak Bay and Lower Cook Inlet. Charter fishing boats, for example, traverse the length of Kachemak Bay and Kennedy Entrance twice each day on the way to the Barren Islands fishing grounds. Temperature and salinity data can be continuously recorded using electronic loggers during these passages. These data are fundamental to understanding mixing dynamics in the Kachemak Bay region. The physical oceanography of this region has not been well studied and an understanding of the physical environment is critical to understanding the fundamental basis of ecosystem dynamics, and habitat distribution.

The abundance of marine organism populations is highly variable in space and time, and possibly linked to fluctuations in oceanic water properties and circulation patterns. Evidence from research in the Pacific Northwest suggests that differences in primary productivity, salinity, and water temperature are often reflected in biological community dynamics. In estuaries such as Kachemak Bay, large gradients can occur at small spatial scales due to the effects of precipitation, surface runoff, groundwater flow, and evaporation. Outside Kachemak Bay, the regional circulation is characterized by ocean currents, such as the Alaska Coastal Current in the Gulf of Alaska flowing onto the shelf near the entrance to Cook Inlet. Nutrient rich bottom water is upwelled and mixed with surface water. As these enriched waters stream into Kachemak Bay, fresh water runoff from the surrounding ice fields and watersheds dilute the salinity and increase the sediment load. The inflowing water, therefore, initially supports a marine system while the north-side, outflowing water is more turbid and less saline. This difference needs to be quantified to further our understanding of the spatial and temporal patterns of observed changes in this system.

One of the unique characteristics of marine populations relative to their terrestrial counterparts is that early life stages of most marine species are planktonic and are moved by ocean currents for weeks to months. At present, we have only a limited understanding of how ocean circulation affects the various life stages of marine populations. This fundamental gap in our knowledge about marine populations limits advances on many

fronts. Managing fisheries, understanding the dynamics and evolution of marine populations, and predicting the responses of coastal ecosystems to perturbations such as pollution, habitat loss, and the spread of exotic introduced species all await breakthroughs in our understanding of ocean circulation.

Despite numerous studies in the late 1960's -1970's, there has been limited work since that time in characterizing the physical oceanographic processes in the Kachemak Bay and lower Cook Inlet. The main study on circulation and mixing effects in Kachemak Bay is a study by Burbank in 1977 (figure 1).

Circulation in the greater Cook Inlet is dominated by strong tidal currents. The long, narrow configuration of Cook Inlet produces the world's second highest tidal heights (the highest are in the Bay of Fundy, Newfoundland). Tidal heights at the mouth and the head of the inlet are 180 ° out of phase. Thus water in the Cook Inlet acts somewhat like a standing wave (Whitney, 1999). The spring to neap tide variation can produce almost a two-fold increase in tidal velocities (SHIO, 1994). Wind is also an important factor affecting the circulation of water in Kachemak Bay and Cook Inlet. In the summer winds are predominantly from the South to Southwest, while in the winter the winds are from the North and Northeast (Wennekens et al., 1975; Whitney, 1999). In addition to the mean wind direction, strong, locally variable winds descend from the surrounding mountains and influence net circulation patterns. Circulation in the region is also strongly influenced by the flow of the Alaska Coastal Current. Water from the ACC becomes entrained into the strong inflow of the bay in the region of the Kennedy entrance.

Previous studies of Kachemak Bay have concluded that the circulation of water in the bay is complex and reflects the combined influences of diurnal and monthly lunar inequalities in tidal forcing, seasonal changes in the tidal regime, meteorological effects and fresh water forcing (Wennekens et al., 1975). Winds have a profound effect on the net circulation of both Kachemak Bay and Cook Inlet. Transient events such as gales may be the most significant factor impacting the transport and dispersal of planktonic larvae and pollutants (Wennekens et al., 1975). Burbank (1977) proposed the existence of several important gyres and eddies at the entrance to and interior of Kachemak Bay (figure 1) but no subsequent studies have further elucidated their spatial and temporal extent. The movement of water in this region is critical to understanding ecosystem dynamics such as larval dispersal, habitat distribution as well as for predicting patterns of pollutant (e.g. oil) dispersal. In other regions of Cook Inlet, back eddies such as the one on the north side of the East Forelands have been shown to deposit oil on the beach when the oil is originating from the south along the shoreline (Whitney, 1999). Thus the currents and

eddies predicted for the entrance to and interior of Kachemak Bay could be extremely important for localized movement and shoreline deposition of organic matter and pollutants such as oil.

A daunting challenge in our understanding of marine ecosystems is identifying the connections between physical variability in the ocean and changes in marine communities. All ecosystems experience physically variable environments, but marine ecosystems are dominated by a particularly complex suite of physical forces. The dynamic nature of the fluid medium in which marine species live affects both the performance and movement of individuals. Studies of individual pieces in this puzzle have generated important insights. For instance, we have studies showing the effects of variation in water temperature, salinity or wave-generated hydrodynamic forces on survivorship and growth or the effects of the changes in ocean circulation on the movement of individuals. However, synthetic studies that integrate the effects of variation in several climatic components are rare. Also rare are studies providing insight into cyclic climatic changes, such as inter-decadal shifts, and unidirectional changes, such as climate change.

Kachemak Bay is a NOAA National Estuarine Research Reserve (NERR). The NERR system has 26 sites throughout the United States that are dedicated to research and education of the marine/terrestrial interface of estuarine ecosystems. Kachemak Bay is located at the interface between land and ocean waters and thus near the juncture of major oceanographic and land-based processes. Watershed influences on the intertidal and bay habitats range from freshwater input, transport of nutrients, sediments and contaminants to topographic influences on winds and precipitation amounts and rates. Changes in watershed vegetation cover due to urbanization, spruce bark beetle infestation, logging and forest fires will alter transport dynamics and nutrient cycling, and thus the habitat quality and structure of biological communities in the intertidal zone and the bay itself. Oceanographic processes, working from the other end of the ocean-bay-shore continuum, influence nutrient transport, life history dispersal mechanisms of plants, invertebrates and fishes, sediments and contaminants. As part of the NERRs system, the Kachemak Bay Research Reserve has a program to continuously measure seasonal oceanographic water characteristics including nutrients, phytoplankton, temperature and salinity at two stations in the Bay (Homer and Seldovia) as part of the national System Wide Monitoring Program (SWMP). These sensor arrays measure water temperature, conductance, salinity, pH, turbidity, dissolved oxygen, depth, PAR, and fluorescence on a continuous basis. Additionally the National Weather Service, National Data Buoy Center, will be deploying a long-term data buoy in Kennedy Entrance in June 2001.

This study will work in conjunction with the existing studies in the region, both those on-going at the research reserve as well as the Cook Inlet Keeper, to further the understanding of circulation and mixing in Kachemak Bay. In addition, collaboration between the Keeper's Citizen's Environmental Monitoring Program and the Kachemak Bay Research Reserve's scientific programs allows for greater community involvement and understanding of the regional circulation and water quality.

NEED FOR THE PROJECT

A. Statement of the Problem

There is a need for understanding the movement and changes of water masses and seasonal mixing dynamics in this area. This study will address this need by using vessels of opportunity and an existing volunteer network to collect time-series of temperature and salinity in the Kachemak Bay region. The collection and processing of these data is critical to understanding the underlying physical mechanisms controlling the ecosystem dynamics, and hence the distribution and recovery of many of the species listed in Table 4 of the invitation to submit restoration proposals. It is also information that is directly beneficial to recreation and tourism in this region, as well as vital to understanding the potential movement of water-borne pollutants such as oil.

B. Rationale/Link to Restoration

Given the lack of oceanographic data collection in the proposed study area, this study will provide a baseline time series of basic oceanographic data, which will be used to enhance critical understanding of mixing processes and dynamics in the region. These baseline data will be collected by volunteers in the community with the results benefiting local communities, villages and the greater scientific understanding of circulation and mixing in the bay. The use of the volunteer network of the Cook Inlet Keeper and ships of opportunity ensures stakeholder involvement in the project.

C. Location

This study will be undertaken in Homer with work involving the participation of personnel and volunteers from the Cook Inlet Keeper and the Kachemak Bay Research Reserve. Transects of temperature and salinity will occur on along-axis (Homer to

Kennedy entrance and return) and across axis (Homer to Halibut Cove and return) regions of the bay. Drift cards will be deployed at a range of locations and will be subsequently collected along the entire Kachemak Bay region. The benefits of the project will be realized by the entire community and stakeholders and the Kachemak Bay region. Community involvement will include the villages and Native corporations of Port Graham, Seldovia and Nanwalek.

COMMUNITY INVOLVEMENT

Integral to this project is the degree of community involvement and participation in the study. The community based volunteer monitoring network of the Cook Inlet Keeper will be directly linked to the research needs of the Kachemak Bay region and the research reserve, forming closer bonds between the local groups and the scientific community.

Cook Inlet Keeper was the first community-based organization in Alaska to start a federally and state-approved volunteer water quality monitoring program. In 1996, Keeper convened a Technical Advisory Committee (TAC) composed of professionals from universities, state and federal agencies, and laid the framework to train volunteers to monitor physical, chemical, and biological parameters of water quality in and around Kachemak Bay. Since that time, Keeper has fostered similar monitoring programs in the Anchorage Bowl, Mat-Su Valley, and Kenai River watershed. Keeper is now leading the most unified, defensible community-based water quality monitoring effort in Alaska, and has been praised by Alaska's Department of Environmental Conservation for *"laying a credible foundation that establishes the role of citizen monitoring as part of a comprehensive watershed management program from which all Alaskans can share in its rewards, both now and into the future"*.

The project will be organized under the Cook Inlet Keeper and will utilize their extensive network of volunteers and citizen monitors to identify volunteer ships of opportunity, assist in the design of transects, sampling locations and schedules. The sampling plan will be designed to include transects of interest along different axes of the study area, including Homer to Kennedy entrance and return, Homer to Halibut Cove and return, and Homer to Bear Cove and return. Keeper volunteers and local communities will also be extensively involved in the deployment and collection of drift cards released at locations in the region in the Fall and the Spring.

PROJECT DESIGN

A. Objectives

Five main objectives will be achieved by this study.

1) Establishing a link between regional research objectives and data collection and an existing successful volunteer monitoring program.
2) Collection of a time-series of temperature and salinity along designated transects in the Kachemak Bay region
3) Analysis of time series data for inferring regional mixing and circulation dynamics and identifying critical areas for future research
4) Establishing a baseline temporal and spatial data set of temperature and salinity for correlation with existing stationary sensor platforms measuring parameters of temperature, salinity, pH, DO, PAR, turbidity, Chla and nutrients. Data collection from this study may be expanded in later studies by the inclusion of additional instrument sensors for water quality parameters along the same spatial and temporal resolution as for the present study
5) Collection of important drift card data for inferring regional surface currents. These data will be correlated with regional wind conditions, and time-series data (from both transects and stationary buoys) and used to infer seasonal surface circulation patterns.

B. Methods

Seabird SeaCat thermo-salinographs will be installed onto vessels of opportunity which will then measure parameters of temperature and salinity along pre-determined transects. Two to three volunteers will be identified for participation in the transect data collection aspect of the study. The instruments will then be installed in the spring of 2002 onto the hulls of these vessels.

Transects will include along-axis and across axis locations, covering regions of inflowing and outflowing water to the bay. These regions are also consistent with existing stationary NOAA and National Weather Service buoys as well as existing water quality monitoring programs.

Data will be downloaded from the vessels onto a laptop and processed and analyzed. Data will be compared with the data collected from stationary NOAA and NWS buoys for correlation. These data will also be compared with on-going water quality data

collected by Keeper volunteers at stations around the Kachemak Bay. Data analysis will be performed to produce graphs, maps, animations, and other correlation materials to graphically display information on seasonal oceanographic conditions and the relation to regional circulation and mixing processes. Data will also be analyzed to identify critical regions for future study in other aspects of Kachemak Bay ecosystem dynamics.

Drift cards will be constructed and deployed over two different seasons and for five different locations. Drift cards will be constructed of either plastic or painted wood, and labeled with pertinent information for their recovery. Each drifter will be color coded by season and location, and labeled with the following:
When found: (date and time)
Where found: (latitude and longitude)
Who found it: (finder's name and address)
Return to: (KBRR address)

Deployments will occur in the Fall/Winter and in the Spring. Locations for deployment include: Anchor Point, Beluga Slough, Homer Spit, Seldovia and Bear Cove. These locations are also consistent with regional data collection. Volunteers from the local community will be involved in retrieving and tracking the positions of drift cards. Retrieval will also be coordinated with the annual beach walk and clean up and will involve the participation of the KBRR, Cook Inlet Keeper and well as the Alaska Center for Coastal Studies.

C. Cooperating Agencies, Contracts and Other Agency Assistance

The cooperating agencies on this project are the Cook Inlet Keeper, NOAA and the ADFG. The involvement of the ADFG however is only through the Kachemak Bay Research Reserve involvement as the KBRR is a NOAA funded research institution with state funded agency (i.e. ADFG) administration.

SCHEDULE

A. Measurable Project Tasks for FY02 (October 1, 2001 - September 30, 2002)

October 30:	Identify cooperating vessels and volunteers
	Order all equipment
	Construct and deploy Fall Drift cards

January 31:	Set-up and configure equipment for appropriate data collection. Attend annual workshop
February 28:	Arrange logistics of surveying schedules, transects, data downloads. Install instruments on vessels of opportunity Construct spring drift cards
April 15	Submit annual report
May 30:	Begin data collection transects, deploy spring drift cards
June 30:	Analyze and process May data
July 31:	Analyze June data
September 30:	Submit report including analysis of all data for temperature, salinity and drift card results.

B. Project Milestones and Endpoints

February 28, 2002:	Fall/Winter drift cards deployed and being retrieved. Thermo-salinographs installed and configured on vessels.
June 30, 2002:	Spring/Summer drift cards deployed and being retrieved. Preliminary data analysis and correlation with stationary buoys completed for May data retrieval.
September 30, 2002:	Completion of drift card study, analysis and correlation completed of temperature and salinity data.

C. Completion Date

Completion of project is by September 30, 2002

PUBLICATIONS AND REPORTS

An annual report will be filed in April 2002 and a final report will be provided at the end of FY 2002.

PROFESSIONAL CONFERENCES

No funds are requested for travel to professional conferences.

NORMAL AGENCY INVOLVEMENT

No aspects of this project are fully funded, and it should be noted that the SWMP instruments and data collection by KBRR requires non-federal match in order to continue.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

This study is also coordinated with the local villages, volunteers and Native corporations of Port Graham, Seldovia and Nanwalek.

PROPOSED PRINCIPAL INVESTIGATOR

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PRINCIPAL INVESTIGATOR

Dr. Diana Stram has a Ph.D. in Oceanography from the Graduate School of Oceanography at the University of Rhode Island (2000). Her research has focussed upon interdisciplinary numerical modeling of physical and biological processes in estuaries.

She has supervised the field collection of time-series data from the Rio Chone estuary in Ecuador, where she was the director of two separate research field surveys in the region, coordinating activities amongst government and community-based agencies. She served as a Pre-Doctoral Fellow for the Environmental Protection Agency under their Program to Develop Indicators of Estuarine Health and Integrity.

Dr. Schoch is the Science Coordinator for the Kachemak Bay Research Reserve in Homer, Alaska (a NOAA National Estuarine Research Reserve). He has a dual Ph.D. in Biological Oceanography and Geological Oceanography from the College of Oceanic and Atmospheric Sciences at Oregon State University (1999) and continues to work with his post-doc advisors (Lubchenco and Menge) as a Senior Fellow for the Partnership for Interdisciplinary Studies of the Coastal Ocean (PISCO) studying marine ecosystem dynamics. His research interests are in the physical and biological linkages between marine nearshore and continental shelf ecosystems, specifically how physical processes such as currents, wave energy, sediment dynamics, and nutrient fluxes structure intertidal and subtidal communities. His current research projects include studying larval distributions and forces affecting recruitment, monitoring the variability of primary productivity as a function of ocean climate, and investigating kelp bed community dynamics. He serves as the science advisor for the Olympic Coast National Marine Sanctuary Advisory Council, and is the chair of their Research Advisory Committee. He also serves as the technical advisor to the Sanctuary Marine Conservation Working Group, consulting on the design and development of a marine reserve network on the outer coast of Washington. He also consults to the Washington Department of Natural Resources on intertidal habitat modeling in Puget Sound and Georgia Straits.

OTHER KEY PERSONNEL

Joel Cooper, the Research Coordinator for CIK and Tom Wallace, the Kachemak Bay Monitoring Coordinator for CIK will also be involved in volunteer coordination and data acquisition for this project.

LITERATURE CITED

Burbank, D.C. 1977. Circulation studies in Kachemak Bay and lower Cook Inlet, vol.II of Environmental Studies of Kachemak Bay and lower Cook Inlet, L.L. Trasky et al. (eds.). Marine/Coastal Habitat Management Report, Alaska Dept. Fish and Game, Anchorage, AK.

SHIO. 1994. NOAA Hazmat Tidal Variation Program, 7600 Sand Point Way N.E., Seattle, WA 98115

Whitney, J. 1999. What the Actual Movement of Oil In Cook Inlet Tells Us About the Circulation in Cook Inlet. In, Proceedings of the Cook Inlet Oceanography Workshop, Johnson and Okkonen (eds.) Kenai, AK.

Wennekens, M.P., Flagg, L.B., Trasky, L., Burbank, D.C., Rosenthal, R. and F.F. Wright. 1975. Kachemak Bay, A Status Report. Alaska Dept. Fish and Game, Anchorage, AK.

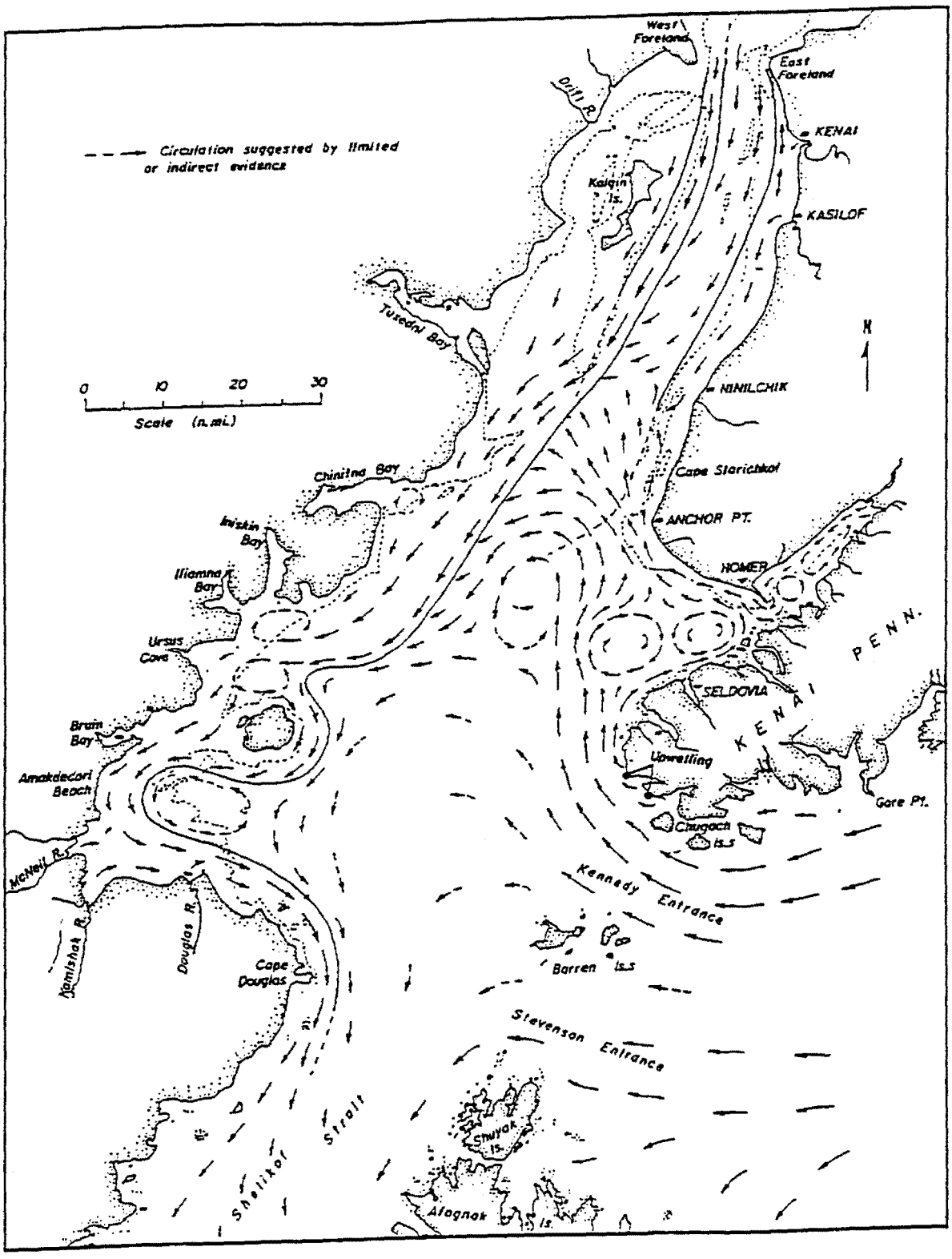

Figure 1: Net surface circulation proposed in Kachemak Bay and lower Cook Inlet (from Burbank, 1977)

FY 02 *EXXON VALDEZ* TRI E COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Budget Category:	Authorized FY 2001	Proposed FY 2002
Personnel		$0.0
Travel		$0.3
Contractual		$32.0
Commodities		$0.0
Equipment		$16.3
Subtotal	$0.0	$48.6
Indirect		$1.0
Project Total	$0.0	$49.6
Full-time Equivalents (FTE)		0.0
Other Resources		

LONG RANGE FUNDING REQUIREMENTS					
Estimated FY 2003					

Dollar amounts are shown in thousands of dollars.

Comments:
$1000 budgeted under indirect costs for overhead costs($1.0).
Matching funds are not reflected in the above budget but include the following:
Matching funds from NOAA for this project include:
$10,000/ stationary buoy deployed (2) = $20,000 ($20.0)
$10,000 per year for maintaining and processing buoy data
Total NOAA matching funds: $ 30,000 ($30.0)

KBRR will provide office space and logistical support for Dr. Stram totalling $5000 ($5.0)

Total matching funds available = $35,000 ($35.0)

FY02

Prepared: 4/10/01

Project Number: 02671-BAA
Project Title: Coordinating Volunteer Vessels of Opportunity to Collect Oceanographic Data in Kachemak Bay and Lower Cook Inlet, submitted under the BAA
Name: Cook Inlet Keeper, Kachemak Bay Research Reserve

FORM 4A
Non-Trustee
SUMMARY

FY 02 *EXXON VALDEZ* TRL : COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Personnel Costs:			Months	Monthly		Proposed
Name	Position Description		Budgeted	Costs	Overtime	FY 2002
						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	0.0	
					Personnel Total	$0.0

Travel Costs:		Ticket	Round	Total	Daily	Proposed
Description		Price	Trips	Days	Per Diem	FY 2002
						0.0
Attendence at Annual EVOS meeting for 2 PIs for 2 days in Anchorage				2	0.1	0.2
(approximate per diem = 50$/person/day, thus 2 days @ $100/day, (		0.1	1			0.1
(travel costs to and from Homer, AK = $100)						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$0.3

FY02

Prepared: 4/10/01

Project Number:
Project Title: Coordinating Volunteer Vessels of Opportunity to Collect Oceanographic Data in Kachemak Bay and Lower Cook Inlet, submitted under the BAA
Name: Cook Inlet Keeper, Kachemak Bay Research Reserve

FORM 4B
Personnel
& Travel
DETAIL

FY 02 *EXXON VALDEZ* TRL : COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Contractual Costs:	Proposed
Description	FY 2002
contract services, Dr. Stram, for one week per month $ 500$ ($0.5/day) 12 weeks X $2500/week ($2.5/week)	30.0
installation of instruments onto vessels(2 vessels and 2 instruments @ 1000$/instrument) ($1.0 X2)	2.0
Contractual Total	$32.0

Commodities Costs:	Proposed
Description	FY 2002
Commodities Total	$0.0

FY02

Prepared: 4/10/01

Project Number:
Project Title: Coordinating Volunteer Vessels of Opportunity to Collect Oceanographic Data in Kachemak Bay and Lower Cook Inlet, submitted under the BAA
Name: Cook Inlet Keeper, Kachemak Bay Research Reserve

FORM 4B
Contractual & Commodities
DETAIL

FY 02 *EXXON VALDEZ* TRU : COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2002
			0.0
1 SBE 21 Themo-salinograph plus shipping and handling	1	7.2	7.2
			0.0
1 SBE 45 Thermo-salinograph plus shipping and handling	1	3.2	3.2
			0.0
1 data logger	1	0.6	0.6
			0.0
I laptop computer	1	4.5	4.5
			0.0
software	1	0.8	0.8
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.	**New Equipment Total**		$16.3

Existing Equipment Usage:	Number	
Description	of Units	

FY02

Prepared: 4/10/01

Project Number:
Project Title: Coordinating Volunteer Vessels of Opportunity to Collect Oceanographic Data in Kachemak Bay and Lower Cook Inlet, submitted under the BAA
Name: Cook Inlet Keeper, Kachemak Bay Research Reserve

FORM 4B
Equipment
DETAIL

Project: **An Investigation into the Continuing Decline of Pigeon Guillemots in the Oiled Portion of Prince William Sound in 2002**

Project Number:	~~New~~ 02673
Restoration Category:	Research/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:	U. S. Geological Service, U. S. Forest Service
Alaska SeaLife Center:	
Duration:	5 Years
Cost FY 02:	$~ 28.7
Cost FY 03:	$~ 29.5
Cost FY 04:	$~ 30.5
Cost FY 05:	$~ 31.5
Cost FY 06:	$~ 32.5
Geographic Area:	Prince William Sound
Injured Resource/Service:	Pigeon Guillemot

ABSTRACT

Pigeon guillemots have declined 56% in Prince William Sound since the *Exxon Valdez* oil spill. This is compounded on a 73% decline from 1972 to 1989. Taken together pigeon guillemots have declined 88% since 1972. The most troubling issue it that the decline is continuing, while some other taxa that also use the nearshore area, black oystercatchers and harlequin ducks, are not declining. The APEX project studied guillemots in Prince William Sound for 5 years in the 1990's. From work done during those years we learned several important aspects about pigeon guillemots. Guillemot populations can be maintained at higher levels when high energy schooling fish such as sand lance are available. Predators like mink can have devastating effects on guillemot productivity. Sand lance populations appeared to be increasing in the late 1990's. As recently as 1999 guillemots in the oiled area were ingesting more oil than guillemots outside the oiled area in Prince William Sound. In this study we propose to investigate factors that are causing the continued decline of guillemots in Prince William Sound. From previous work we suspect one or more of three major factors are causing the decline; reduced prey base, increased predation, or continuing oil effects. The first year the study will focus on food and predation as analyses for oil effects is more expensive.

INTRODUCTION

A great deal of attention has been given to the relationship between numbers of seabirds and the temporal and spatial aspects of their prey (e.g., foraging range of birds, predictability vs. patchiness of prey, abundance of prey during and outside the breeding season). Lack (1967) believed that populations of marine birds are regulated by density-dependant factors such as food supply outside the breeding season, whereas Ashmole (1963) argued that it is availability of food during the breeding season that is limiting, because at this time the adults feeding young are constrained to foraging within a certain distance of their colony. Lack (1967) noted that pelagic feeders tend to nest in large colonies and inshore feeders in smaller, less dense colonies. Likewise, Diamond (1978) showed that migrant species tended to be more numerous than resident species. Both related these observations to the relative sizes of the available foraging areas. Pelagic feeders would obviously have a larger foraging area than inshore feeders; also, migration to an alternate feeding area during the nonbreeding season would be equivalent to using a larger area during the breeding season.

Birt et al. (1987) found evidence of prey depletion within the normal foraging depths of double-crested cormorants around Prince Edward Island. Furness and Birkhead (1984) also tested the idea of prey depletion by considering the size of seabird colonies relative to their spatial distribution, and found a negative correlation between the size of a colony and the number of conspecific colonies within the foraging range of the species (species studied included Northern Gannets, Shags, Black-legged Kittiwakes, and Atlantic Puffins). The results of both studies provide support for Ashmole's hypothesis that seabird populations are limited by intraspecific competition for food during the breeding season.

Cairns (1989) proposed a hinterland model of population regulation of seabird colonies that was based on the idea that colony size is related to the amount of foraging habitat used by a colony. This model suggests that seabirds from neighboring colonies use non-overlapping foraging zones and that the population of a colony is a function of the size of these zones. In her study of Galapagos Penguins, Boersma (1976) found that chicks raised on an island grew faster than those on the nearby mainland, and related this to the fact that adults nesting on a small island can forage over twice as much area as those along a coast.

Pigeon Guillemots forage in the nearshore environment within a few kilometers of their colonies, but feed on both demersal and schooling fish. Although differences in the diet of guillemot chicks certainly reflect local differences in the availability or abundance of prey, there are clear indications of adult prey specialization patterns within colonies (Kuletz 1983, Golet et al. 1998). Schooling fish such as sand lance, herring, and capelin may be subject to temporal and spatial fluctuations in abundance. Nearshore demersal fish probably constitute a more predictable food source. At Naked Island the proportion of sand lance in the diet of guillemot chicks has declined dramatically since 1979, and gadids, which were generally not present in the diet before the *Exxon Valdez* oil spill, now make up a much larger component of the diet (Oakley and Kuletz 1994, Hayes 1995, Golet et al. 1998).

At numerous colonies around Naked Island, the number of breeding birds has decreased considerably since 1979. In the absence of schooling fish, guillemots must rely more heavily on demersal fish. Competition for these demersal fish over the limited shallow-water foraging area surrounding Naked Island may be preventing some adults from breeding or successfully raising their young. However, at Jackpot Island, where a large portion of the chick diet is schooling fish (predominantly herring), the

percent of breeding birds in the population appears to be much higher. In most years, nest sites, not food, may be limiting the number of guillemots at this small island. In 1997, however, it appears that food played a role in limiting breeding population size at Jackpot Island. Herring dropped out of the diet in 1997, and many guillemots abandoned their eggs, presumably because the prey base they normally rely upon had nearly disappeared. Only 12 guillemot pairs fledged chicks at Jackpot Island in 1997, when herring was 3.5% of the diet, compared to 25 that were successful fledgling chicks in 1995, when herring comprised 41.3% of the chick diet.

The post-spill decline in sand lance in the diet of guillemots breeding at Naked Island might be a key element in the failure of this species to recover from the oil spill. Pre-spill studies of Pigeon Guillemots breeding at Naked Island suggest that sand lance are a preferred prey during chick-rearing. In 1979-1981 a relatively large proportion of the breeding guillemots at Naked Island specialized on sand lance; today there are fewer specialists, probably because this resource is too scarce and patchy. Breeding pairs that specialized on sand lance tended to initiate nesting attempts earlier and produce chicks that grew faster and fledged at higher weights than breeding pairs that preyed mostly upon blennies and sculpins in years when sand lance were readily available (Kuletz 1983). Even in more recent years (1989-1990 & 1994-1997), when high energy density schooling fishes, such as sand lance, were less available, adults that specialized on them had chicks that grew faster and attained higher overall reproductive success than adults that specialized in lower energy demersal fishes or gadids. Thus, the overall productivity of the guillemot population appears to be higher when sand lance and other high energy density fishes are more widely available. The high lipid content of many of the pelagic schooling fishes relative to that of demersal fishes and gadids (D. Roby, personal communication), certainly make these prey fishes a high-quality forage resource for PWS Pigeon Guillemots. This is consistent with the observation that other seabird species (e.g., puffins, murres, kittiwakes) experience enhanced reproductive success when sand lance are available (Pearson 1968; Harris and Hislop 1978; Hunt et al. 1980; Vermeer 1979, 1980). This component, in conjunction with the Seabird Energetics component (99163 G), will help assess the relative importance of high energy density schooling fishes such as sand lance and herring in maintaining productive colonies of guillemots in south central Alaska.

NEED FOR THE PROJECT

A. Statement of problem

The population of Pigeon Guillemots in Prince William Sound (PWS) has decreased from about 15,000 in the 1970's (Isleib and Kessel 1973) to about 4,000 in 1989 to 1,800 in 2000 (Stephensen et al. 2001). There is some evidence (Oakley and Kuletz 1993) suggesting that this population was in decline before the *Exxon Valdez* oil spill in March of 1989. An estimated 2,000 to 3,000 Pigeon Guillemots were killed throughout the spill zone immediately after the spill (Piatt et al. 1990). Based on censuses taken around the Naked Island complex (Naked, Peak, Storey, Smith, and Little Smith Islands), pre-spill counts (ca. 2,000 guillemots) were roughly twice as high as post-spill counts (ca. 1,000 guillemots); also, relative declines in the numbers of guillemots were greater along oiled shorelines than along unoiled shorelines (Oakley and Kuletz 1994). The population has continued to decline since the spill.

B. Rationale/link to Restoration

Considerable baseline data on Pigeon Guillemot populations in PWS and their reproductive and foraging ecology were collected both before and after the *Exxon Valdez* oil spill. Continuation of these efforts is essential for monitoring any trends in the PWS populations. There is a critical need for this information to understand the constraints that currently limit the recovery of pigeon guillemot populations affected by the oil spill.

C. Location

This study will be conducted in Prince William Sound. The principle study area will be Naked Island located in the central portion of Prince William Sound, which was oiled.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

We would be happy to provide informational meetings in communities within Prince William Sound. All the communities in Prince William Sound are 10's of miles from Naked Island and guillemots that inhabit Naked Island probably do not spend time near the communities making it difficult to use traditional ecological knowledge from the local communities to relate to guillemots at Naked Island.

PROJECT DESIGN

A. OBJECTIVES

To determine if poor pigeon guillemot productivity is causing the continued population decline.

To determine if lack of proper prey or egg/chick depredation are major causes of low productivity.

Band chicks and adults so that survival rates may be assessed in the future.

B. METHODS

Below are outlines of our field methods; details are reported in a separate document entitled "Pigeon Guillemot Field Protocol".

Population Censusing:
In PWS, guillemots will be censussed at Naked, Peak, Storey, on the mornings of May 28-30 to ascertain population size. Two to three counts of western Naked Island will be made during this period These data will be used to determine if the populations at are recovering from injury incurred following the *Exxon Valdez* oil spill. Censuses will be conducted with whalers piloted 100 m offshore. All guillemots sighted onshore and in the water within 200 m of land will be counted, and their locations recorded.

Resighting:
Individually color marked birds are needed to assess differences in delivery patterns and prey

specialization among individual adult guillemots. Resighting banded birds and identifying their nest burrows will facilitate such comparisons. As well, resighting will allow estimation of juvenile and adult survival, and sex determination.

Identifying Nest Sites:
Nest sites (in burrows, under tree roots, or in rock crevices) must be identified for studies of productivity, chick growth rates, diets, and meal sizes, adult prey delivery rates, predation, and collection of bio-samples. These sites will be used for capturing adults, thus allowing their banding, measuring and dying, necessary steps for studies of adult body condition, foraging patterns and investigations of individual adult's prey selection preferences.

Chick Diet and Delivery Rates:
Because adult guillemots carry single whole fish in their bills when provisioning their chicks, information on prey species composition can be readily obtained by making direct observations of active guillemot nests during chick-rearing. Observations will be made at selected groups of guillemot nests throughout the nestling period to collect diet and delivery rate data, and to characterize various aspects of adult foraging.

Monitoring Nests:
Nests will be monitored throughout the breeding season to determine reproductive success parameters, chick growth rates, and predation. All accessible burrows should be checked initially in early June (every couple of days if possible) to determine if egg(s) are present. Then, beginning late in incubation, nests will be checked every 5 days. Nest checks will terminate when nestlings fledge or it has been positively determined that the nesting attempt failed.

Productivity Parameters:
The following parameters will be determined from the monitoring of 60 nests:

Clutch Size[a] (eggs per nest with eggs)	
Lay Date[b]	
Incubation Period[a]	
Hatching Date[b]	
Mean Hatching Success[a] (% of eggs laid that hatch)	
Fledgling Success[a] (% of chicks hatched that fledged)	
Productivity[a] (% of eggs laid that fledged)	[a]mean
Nesting Success[a] (% of nests where at least 1 chick fledged)	[b]median

Chick Growth Rates:
A subset of the nests monitored for productivity will be used to assess chick growth and development. Chick growth rates provide a useful index of food availability. They also can demonstrate differences in the foraging proficiency of adult birds. Collection of these data are critical for comparisons among years, among colonies, and among adults with differing foraging strategies.
All accessible guillemot nests on Naked Island will be used for collecting growth rate and productivity data. All guillemot chicks that are handled will be banded (one USFWS metal band and three color plastic bands).

Chick Meal Collections:
We will collect chick meals in order to determine the mass, energetic content, and species composition of the prey items being delivered to the guillemot chicks at Naked Island. The parameter of interest is the total amount of food delivered by the adult.

Capturing Adults:
At least 10 (and preferably many more) adults will be captured to assess body condition, to band and dye individuals for energetics and foraging ecology studies, to intercept meals being delivered to chicks, and to collect bio-samples. All adults captured will be individually marked with colored leg bands, dyes, and streamers. These morphometric variables will be used to derive a condition index for adults during chick-rearing. Adults will be marked in three ways. The individual color bands will allow identification at the colony during meal delivery and adult foraging ecology studies. The dye marks and streamers, in conjunction, will identify individual birds while at sea, when it is often difficult to see the legs. This will permit the identification of foraging locations of individual birds.

Adult Body Condition:
When adults are captured, their weight, wing length, outer primary length, tarsus, and culmen will be measured. Principle components analyses will be used to relate mass to body size for a determination of adult body condition

Food Availability:
Information will be collected on species diversity and abundance of benthic and schooling fish through the use of minnow traps and beach seines in several areas near the colonies. Prey items may also be sampled opportunistically, through sand lance stomping and rock turning in the intertidal regions.
-- Minnow traps will be set at 4 sites at Naked. Traps will be set at these sites three times during the chick rearing period and left for 24 hours. Trapping locations will be chosen from areas where guillemots have been observed feeding. Shrimp and crab will be counted, samples of each fish species will be collected, and the approximate percentage recorded.
-- Five sites at Naked will be seined five times. Seining of a given site will take place approximately every 7 days. Seining sites were established in 1996. Methods of the seining were detailed by Martin Robards.

Foraging Patterns:
One of the primary objectives of the project is to better understand the effects that differences in diet composition and delivery rates have on the growth and development of chicks. However the selection of different prey items for the chick may also affect maintenance costs, energetic requirements, body condition, and the survival of the adults. Prey that promote rapid growth in the chicks may be energetically expensive for the adults to obtain. By characterizing the foraging patterns of adult guillemots while simultaneously monitoring the chicks, the costs and benefits of different foraging strategies, and varying prey availabilities can be assessed in a comprehensive manner. Because individual guillemots have been shown to have a high degree of specialization in their prey selection (even within colonies), drawing the link between the foraging patterns of the adults at sea, and the growth and development of the their chicks may be especially fruitful in the present study.

Furthermore, one mechanism that has been proposed for causing the decline of guillemots in PWS is a reduction in high energy density schooling fishes. The current population may be reduced because these

high quality prey items are less widely available to breeding birds. A foraging study may help establish if and how foraging options of guillemots are limited when adults are selecting demersal fishes compared to when adults are selecting pelagic schooling fishes.

Depredation:

All failed nests will be checked to determine the cause of failure(e.g., predation, abandonment, starvation).

C. Cooperating Agencies, Contracts, and Other Agency Assistance

This project will be conducted on U. S. Forest Service land. We will obtain a permit from the Forest Service and cooperate in any way that we can. We will enter into a cooperative agreement with USGS and Oregon State University to fund a graduate student to conduct the study.

SCHEDULE

A. Measurable Project Tasks for FY 02 (October 1, 2001-September 30, 2002)

October-April:	Arrange logistics for field work, hire and train personnel.
May - August:	Conduct fieldwork, collect data.
September:	Data entry and error checking.

B. Project Milestones and Endpoints

At the end of each breeding season productivity of guillemots will be assessed and reasons for failed nests will be determined. Population data will be compared to previous years to determine if the decline has abated.

C. Completion Date

This project will run for five years or shorter if the guillemot population stops declining either through restoration or naturally.

PUBLICATIONS AND REPORTS

January 15, 2003:	Draft Report to Peer Review
April 15, 2003:	Annual Report complete

PROFESSIONAL CONFERENCES

No funds are requested for attending meetings.

NORMAL AGENCY MANAGEMENT

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, guillemot populations within the oil spill area 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 2 permanent personnel during the March and July surveys to help reduce costs.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Principle investigators from other EVOS trustee council funded projects have used our data in the past. Data from this study would be helpful for the sea otter, harlequin duck, portions of the nearshore vertebrate predator project (\025), and the marine bird survey project 02159. All other projects that are showing lack of recovery in other species would be interested in why guillemots are not recovering.

EXPLANATION OF CHANGES TO CONTINUING PROJECTS

New project.

PROPOSED PRINCIPAL INVESTIGATORS

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PROPOSED PRINCIPLE INVESTIGATORS

1. Co-Project Leader -Dr. David B. Irons, Wildlife Biologist.

Dr. David Irons received his PhD 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 has authored or co-authored more than 30 publications, plus dozens of reports. He conducted marine bird and sea otter surveys in Prince William Sound in 1984 and 1985. He has been studying kittiwakes in Prince William Sound for 17 years and completed the *Exxon Valdez* oil spill kittiwake damage assessment study. Dr. Irons has overseen several seabird studies in the past several years, including marine bird and sea otter surveys of Prince William Sound and Cook Inlet, seabird monitoring studies on St. Lawrence Island and Little Diomede Island, studies on pigeon guillemots, seabirds and forage fish, and a cost of reproduction study on kittiwakes.

Selected Seabird Publications:

Lance B. K., D. B. Irons, S. J. Kendall, L. L. McDonald. 2001. An evaluation on marine bird population trends following the Exxon Valdez oil spill, Prince William Sound, Alaska. Marine Pollution Bulletin.

Irons, D. B., S. J. Kendall, W. P. Erickson, L. L. McDonald, and B. K. Lance. 2000. Chronic effects of the *Exxon Valdez* oil spill on summer marine birds in Prince William Sound, Alaska. Condor 102:723-737.

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2. Co-Project Leader - Dr. Daniel Roby, Associate Professor

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OTHER KEY PERSONNEL

None at this time.

LITERATURE CITED

Ashmole, N.P. 1963. The regulation of numbers of tropical oceanic birds. Ibis 103b:458-473.

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Boersma, P.D. 1976. An ecological and behavioral study of the Galapagos penguin. Living Bird 15:43-93

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2002 EXXON VALDEZ TRUST COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Budget Category:	Authorized FFY 2001	Proposed FFY 2002
Personnel		$15.0
Travel		$1.3
Contractual		$29.6
Commodities		$5.7
Equipment		$1.5
Subtotal		$53.1
General Administration		$4.3
Project Total		$57.4
EVOS Total		$28.7
Full-time Equivalents (FTE)		0.5
Other Resources		$28.7

LONG RANGE FUNDING REQUIREMENTS

Estimated FFY 2003	Estimated FFY 2004	Estimated FFY 2005	Estimated FFY 2006
$29.5	$30.5	$31.5	$32.5

Dollar amounts are shown in thousands of dollars.

Comments:
USFWS will pay the following in-kind support
Irons Salay 1 month @ $7.0/month
USFWS will pay for 50% of the projected cost = $28.7K

USGS will pay for the following in-kind support
Roby Salary 1 month @ $7.0/month

2002

Prepared: 1 of 4

Project Number: New Project 02673
Project Title: Pigeon Guillemot Declines In Prince William Sound
Agency: DOI - Fish and Wildlife Service

FORM 3A
AGENCY
PROJECT
DETAIL

04/13/2001

2002 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
	Unknown	Technician	GS5 - 1	3.0	2,500		7.5
	Unknown	Technician	GS5 - 1	3.0	2,500		7.5
			Subtotal	6.0	5,000	0	
Those costs associated with program management should be indicated by placement of an *.						**Personnel Total**	$15.0

Travel Costs:		Ticket	Round	Total	Daily	Proposed
PM	Description	Price	Trips	Days	Per Diem	FFY 1996
	Truck and boat on train Portage - Whittier	40	4			0.2
	Per diem, (camp rate), 3 people, 90 d summer			270	3	0.8
	Per diem, (travel rate), 3 people, 2 d			6	48	0.3
						0.0
						0.0
Those costs associated with program management should be indicated by placement of an *.					**Travel Total**	$1.3

2002

Project Number: New Project
Project Title: Pigeon Guillemot Declines In Prince William Sound
Agency: DOI - Fish and Wildlife Service

FORM 3B
Personnel
& Travel
DETAIL

2002 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Contractual Costs:	Proposed
Description	FFY 1996
Contract with USGS, Oregon State University for Graduate Student	29.6
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$29.6

Commodities Costs:	Proposed
Description	FFY 1996
Boat fuel (10gal/day/boat) 60 boat-days; @ $2.00/gal	1.2
Food ($10.00/person/day) 3 people for 90 days	2.7
Rain gear, rubber boots and gloves for 3 people @ $200/person	0.6
Scientific supplies (batteries for radios & other equipment, waterproof notebooks & paper, thermometers, wind guages)	1.2
Commodities Total	$5.7

2002

Project Number: New Project
Project Title: Pigeon Guillemot Declines In Prince William Sound
Agency: DOI - Fish and Wildlife Service

FORM 3B
Contractual & Commodities DETAIL

2002 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

New Equipment Purchases:	Number of Units	Unit Price	Proposed FFY 1996
Description			
Emergency replacement of equipment			1.5
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$1.5

Existing Equipment Usage:	Number of Units	Inventory Agency
Description		
Camping supplies		DOI -FWS
Survival suits	3	DOI -FWS
Mustang suits	3	DOI -FWS
Float coats	3	DOI -FWS
Boat	2	DOI -FWS
Tents	5	DOI -FWS

2002

Project Number: New Project
Project Title: Pigeon Guillemot Declines In Prince William Sound
Agency: DOI - Fish and Wildlife Service

FORM 3B
Equipment
DETAIL

Project Title: **Assessing Pigeon Guillemot restoration techniques and feathers as biomonitors**

Submitted Under the BAA

Project Number: 02674-BAA

Restoration Categories: Restoration and Monitoring

Proposers: John French
PEGASUS ENTERPRISES
Seward, Alaska

George Divoky, Research Associate,
Institute of Arctic Biology
University of Alaska Fairbanks

Lead Trustee Agency:

Cooperating Agencies: None

Alaska SeaLife Center: Yes

Duration: 1st year 3-year project

Cost FY 02: $78,128

Cost FY 03: $000,000

Geographic Area: Prince William Sound, Resurrection Bay, Kodiak, Shumagin Islands other Gulf of Alaska locations

Injured Resource: Pigeon Guillemot

ABSTRACT

We propose to 1) monitor Pigeon Guillemot restoration projects initiated between 1998-2000 and 2) conduct a preliminary examination of the utility of guillemot feathers as indicators of ecosystem variability and contamination. We will conduct censuses of Resurrection Bay to determine survivorship of birds fledged from the Alaska SeaLife Center and also monitor the occupancy and success of artificial nest sites we erected in the Gulf of Alaska (GOA). Established man-made colonies in the GOA will be visited to assess the reasons for their attractiveness to guillemots. Temporal and geographical variation in the structure and contamination of the GOA food web will be examined through isotopic and trace metal analysis of recently collected Pigeon Guillemot feathers.

INTRODUCTION

The oil spilled from the T/V *Exxon Valdez* on Good Friday 1989 (EVOS) caused widespread injury to a variety of state and federally managed resources in Prince William Sound (PWS) and the Gulf of Alaska (GOA). The oiling of coastal habitat extended from the point of grounding in PWS west to Chignik on the Alaska Peninsula. The highest mortality of seabirds is thought to have occurred in and around the Barren Islands with the highest body count on the shores of the Kodiak Archipelago. Over 600 Pigeon Guillemot (*Cepphus columba*) carcasses were found and identified following the spill, with only 135 from PWS. This suggests that up to 80% of fatal injury to guillemots occurred outside the Sound.

Despite the large number of guillemot mortality outside of PWS, much of the early Natural Resource Damage Assessment (NRDA) effort and the early restoration and monitoring work on guillemots concentrated on birds and habitat on and around Naked Island in PWS (Oakley and Kuletz 1996). In part, this was due to it being in one of the most heavily oiled parts of the spill area, and because there was pre-spill census, feeding and productivity data from Naked Island (Oakley 1981, Kuletz 1983). Later studies were conducted at Jackpot Island (Seiser 2000), in a much more lightly oiled part of PWS, and Kachemak Bay, in Lower Cook Inlet (Prichard 1997). Over a decade after EVOS, the Pigeon Guillemot is one of the four seabird species that have failed to recover to pre-spill numbers. Reasons for this failure are unknown but may include: 1) changes in prey quality or availability, 2) increased predation on eggs and nestlings or 3) continuing exposure to oil by either guillemots or their prey. Much of the fieldwork conducted on the Pigeon Guillemot's lack of recovery examined the role of prey in chick growth (Golet 2000) or the potential of oil ingestion decreasing survival in chicks (Prichard et al. 1997)

In 1998 the EVOS Trustee Council initiated Pigeon Guillemot Research at the Alaska SeaLife Center (ASLC) (EVOS project #98327). This project continued the examination of prey quality and oil ingestion on nestling condition but since it was conducted in a laboratory setting provided levels of control that could not be obtained in previous studies. Moreover, at the end of the nestling period all chicks were released into the wild after being banded with unique color-band combinations. Of the 145 chicks fledged from ASLC in 1998-2000, over 50 could be expected to survive to breeding and recruit at the natal colony, based on known rates of recruitment for wild cohorts. Guillemots display high levels of philopatry to the natal area (Divoky 1998) and over 90% of the surviving birds should attempt to recruit in northern Resurrection Bay. The majority of guillemots recruit in their third summer and the next three years provide a unique opportunity to obtain data on the effect of nestling condition on survival to breeding. Major differences in survival and recruitment related to diet or oil dosing would add much to our understanding of the lack of recovery for this species.

In 1998 the same research project that raised guillemot chicks at ASLC also began a study on the feasibility of nest-site provisioning as a restoration option for Pigeon Guillemots. Guillemots are cavity nesters that breed in a wide range of cavity types that provide eggs and chicks protection from predators (Storer 1952). While receiving far less attention than nestling caloric intake and oil ingestion, predation on guillemot nest contents in PWS Pigeon Guillemots has increased over the last two decades (Hayes 1995, Seiser 2000) and could be a major factor in the continuing low numbers in PWS. Nesting cavities that supported successful breeding when predation rates were low may now be unable to provide safety to nest contents or breeding adults during the 80-day breeding period. Both the Pigeon Guillemot and its congener, the Black Guillemot (*C. grylle*),

breed in man-made nest cavities and populations of the latter have been able to expand their range and increase in numbers through the provision of artificial nesting cavities (Divoky 1998). To examine the potential of artificial nest sites, arrays of nest boxes and decoys were installed in northern Resurrection Bay in 1998-2000 and on Jackpot Island in 2000. No use of the Resurrection Bay sites has yet occurred but time is required for any new nest site to be occupied by birds in breeding condition, especially in an area of low breeding density such as Resurrection Bay. Once established as breeders, guillemots show high levels of site-fidelity with 95% of individuals breeding in their site of the previous year (Divoky 1998). Prospecting nonbreeders typically attempt to recruit at established sites where they can breed with an experienced bird rather than prospecting for new sites with another inexperienced bird. While new nest sites are occupied on a regular basis, it takes time for their discovery and occupation by two birds not currently associated with another site. Moreover, refinement of nest placement techniques means that the 50 sites installed in Resurrection Bay in 2000 probably have the highest chance of attracting and supporting breeding guillemots.

The summers of 2002-2004 are critical ones in assessing the results of the captive release and nest-site provisioning conducted in 1998-2000. The potential for observing the majority of the ASLC fledglings that return to Resurrection Bay is high. The release of 145 fledglings over a three-year period greatly increased guillemot production in northern Resurrection Bay where the resident 30 breeding pairs could be expected to produce only 30 chicks annually. Assuming normal survival to breeding and natal philopatry, over 50 of the ASLC fledglings should return to northern Resurrection Bay. These returnees will also assist in the assessment of the attractiveness of artificial nest sites as natural nest sites could become limiting as the pool of potential recruits in the region more than doubles.

In addition to our proposed work in Resurrection Bay we intend to conduct an examination of nest-box provisioning at extant colonies in PWS. At Jackpot Island, where the number of breeding birds has been increasing (Seiser 2000) we installed 21 nest boxes late in the breeding season in 2000 and intend to install a similar number on Naked Island in 2001. The former colony has high densities of guillemot nests and has been increasing in numbers while the latter has low densities and has been declining. Two of the boxes placed on Jackpot in 1996 have been utilized by breeding guillemots and it may be that the success of nest-box provisioning is dependent on density or population trend. Installation of boxes on Naked Island and continued monitoring of both Jackpot and Naked islands should allow a more accurate assessment of how nest box provisioning can increase the size of existing colonies.

Guillemots are an excellent monitor of nearshore conditions. The Black Guillemot was chosen as a target species for the Arctic Monitoring and Assessment Program, a circumpolar monitoring program, and Pigeon Guillemots could be an important part of the monitoring that is intended to take place under the Gulf Ecosystem Monitoring (GEM) program. Our proposed research will include two components that could provide benefits to a long-term monitoring program in the GOA. The first intends to increase the number and accessibility of guillemot nests by determining how to best create man-made Pigeon Guillemot colonies. We intend to visit extant Pigeon Guillemot colonies in man-made structures in the Gulf to determine the characteristics that allow them to attract prospecting birds and allow successful breeding. Data obtained will allow us to refine our nest-box installations, assess these sites as monitoring locations and allow determination of how nest boxes could best be placed on other docks or man-made structures in the GOA. Seabirds typically breed in inaccessible locations and habitats and use of man-made

nest sites has provided some of the most detailed data on breeding seabirds (Coulson 1988). The development of guillemot colonies in working and abandoned docks could allow the creation of a network of monitoring locations that would provide relatively easy collection of nesting information or tissue from eggs or chicks. Currently most guillemot nests in the GOA are accessible only through rock climbing. In addition, determining their exact location requires additional time in the field. This is not the case with nests in man-made structures..

Finally we propose a pilot study to determine the utility of using guillemot nestling down and body feathers as a non-destructive technique for monitoring temporal and geographic variability in the GOA. Chemical analysis of the stable isotope ratios and trace metals in feathers has been shown to be a useful tool in understanding bird movements and ecosystem structure and contamination (Edwards and Smith 1984, Thompson et al. 1998). Ongoing research on the feathers of Black Guillemots in Arctic Alaska show that guillemots are tracking long-term trends in productivity of arctic waters (as measured by delta C13) and that trace metals provide information on the wintering latitude of an individual (Divoky unpubl.). Very little is known about the geographic variability of guillemot habitat in the GOA or the wintering area of adults and any insights that down and feathers could provide would greatly assist biologists in the determination of reasons for the lack of a recovery. The examination of geographic variability would typically require studies of breeding biology in a number of locations but feather analysis can provide a preliminary assessment of variability at relatively low cost. We propose to analyze down previously collected (in 1999-2001) from guillemot chicks originating at three distinct locations (Juneau, Prince William Sound and Kodiak) to determine if there are location-specific or annual differences in isotopic and trace metal composition. Nestling down is produced by yolk from the maternal parent and reflects a combination of endogenous and exogenous energy sources mobilized in the two weeks before egg laying. Nestling body feathers, which we intend to collect in the course of fieldwork in 2001 and during the proposed research, are integrators of the prey consumed by the nestling between hatching and fledging. Geographic comparisons of nestling body feathers should demonstrate differences in the nearshore ecosystems that support the nestlings and comparison of nestling down with body feathers from the same locality can provide insights into the dissimilarities between a female's wintering area and waters near the breeding colony. Analysis of feathers also provides information on the trace metal contamination of a region and, since *Cepphus* is a target genus of the AMAP program, any information obtained for the GOA can be used in a synoptic view of contamination in guillemot feathers in the Arctic and subarctic.

NEED FOR THE STUDY

A. Statement of problem

Pigeon Guillemot populations in Prince William Sound have decreased greatly in the past two Decades, going from 15,000 to 5,000 individuals (Laing and Klosiewski 1993). They have failed to recover from declines that began before the EVOS and both the reasons for the lack of recovery or workable restoration options are still unknown. As stated above, potential reasons for the the lack of recovery are not clear but could include a change in prey from high to low lipid fish resulting in decreased breeding success and/or adult survival, residual oil in the nearshore increasing mortality, or increased predation on nest contents by mink and avian predators associated with the nearshore.

Studies that focused on the role of prey quality and oil ingestion are now completed (Golet 1999, Prichard et al 1997) but without a clear indication of the reason for the decline and continued low carrying capacity. Unfortunately most of these studies centered on the relationship of prey quality or oil ingestion to nestling growth or condition at fledging and failed to determine how the variables affected post-fledging survival. The assumption was that post-fledging survival was related to fledging condition although there is not proof of this for guillemots.

From 1998-2000 research was conducted at the Alaska SeaLife Center that examined the response of chick growth and blood parameters to diet treatments and oil dosing. Data from that work is currently being analyzed by Dan Roby at Oregon State University and George Divoky of the University of Alaska Fairbanks to determine how diet and dosing treatment affected growth, blood chemistry, and fledging age and mass. While these current analyses are important examinations of how variability in caloric and oil ingestion can affect nestling growth and fledging condition, they too assume that variation in nestling and fledging quality affects post-fledging and pre-breeding survival. Changes in these two demographic variables directly affect population growth (unlike any measure of nestling or fledging condition) and information on the relationship between chick condition and survival to breeding would allow the development of population models that incorporate prey quality and oil ingestion. Information on this relationship will be of use in determining the utility of past and future field studies of nestling condition.

Nest box provisioning remains one of the few direct restoration options available for Pigeon Guillemots. Assessment of nest-provisioning efforts takes time both because recruitment cannot be expected to be immediate and also since nest installation techniques need to be refined during the course of a project. The 65 nest sites installed in Resurrection Bay and the 21 nest boxes on Jackpot Island need to be monitored for a number of years to determine if they will be occupied and allow breeding success similar to natural site. The considerable effort that was put into building and installing these sites will be wasted if they are not monitored over the next few years. We propose to combine the monitoring of those nest boxes with a pilot program that would include the collection of nestling down and feathers for chemical analysis and also determine if creation of a network of guillemot monitoring sites in man-made structures is possible.

B. Rationale/Link to Restoration

Our proposed work would have direct benefits to 1) understanding the reasons for the decline and lack of recovery of Pigeon Guillemots in PWS and 2) development of a direct restoration technique that has been known to increase guillemot populations elsewhere.

Fledging mass has been linked to post-fledging survival in some Black-legged Kittiwakes (Coulson and Porter 1985) and Gannets (Sula capensis) Jarvis 1974 but not in an Atlantic Puffins (*Fratercula arctica*) Harris and Rothery 1985. The Pigeon Guillemots fledged from the ASLC offer a unique and valuable resource in that not only are nestling mass and age known but the actual caloric intake and oil dosing is known. The survivors of the 145 fledglings released from ASLC provide an opportunity to examine the affects of nestling conditions on subsequent survival. It is unlikely an opportunity like this will occur again and if it does it will only happen after an extensive captive-rearing program. Determination of the dietary factors relating to survival to breeding would allow modeling of guillemot populations using specific values for caloric intake or oil ingestion. This

would greatly increase our understanding of population trends during periods of regime shifts or chronic oiling and allow refinement of future research and restoration efforts on this species..

Nest site provisioning could be a relatively simple and straightforward restoration technique, once managers know more about the conditions when it can be successfully deployed. Guillemots are a generalist cavity nester that occupy a number of sites with the primary requirement being overhead cover (Storer 1952). If artificial sites are successful in attracting breeding adults they can be used to enhance productivity, recruitment and immigration. Recruitment to newly provisioned sites may take time but if the sites can provide nesting success that is equal to or higher than natural cavities nest boxes could be an important restoration option when predation rates are high. Examination of nest boxes on Jackpot Island show that nest boxes when properly placed are occupied by Pigeon Guillemots and can provide advantages over natural sites. When personnel associated with this proposal visited Jackpot in 2000 we found that the 1996 installation of 14 boxes by U.S. Fish and Wildlife personnel had the majority of boxes in locations where terrestrial predators had easy access to the nest cavity. Only two boxes were placed on vertical substrates separated from horizontal avenues that would allow terrestrial predators access to the nesting cavity. Both of those boxes had been used by nesting guillemots, one in 1998 and the other in 2000. The 1996 placement of boxes on Jackpot Island may indicate why the 15 nest boxes placed on Naked Island have not been able to attract guillemots. In 2001 we plan to reposition boxes on Naked as well as install new ones so that they do not allow access to terrestrial predators.

Our proposed research will examine the use of artificial nest boxes in a range of conditions:

1) locations where there are currently no birds (ASLC and Army dock in Resurrection Bay)
2) locations with small numbers of birds (Hat Island in Resurrection Bay)
3 locations with depressed populations (Naked Island)
4) locations with increasing populations (Jackpot Island).

Examining nest installations in this range of conditions should allow us to determine if nest-site provisioning can be used as a restoration option and in what conditions it would be most useful.

Our proposed work on the isotopic and trace metal composition of down and nestling feathers is an attempt to develop new insights into a non-recovering species in an area that has undergone major oceanographic change in the last two decades. The results could provide insights not only into guillemots but also the entire nearshore ecosystem that supports the guillemots. Analysis of Black Guillemot feathers in northern Alaska has shown that guillemot feathers can indicate temporal and spatial variability in productivity, trophic level and contamination (Divoky unpubl.). Should the initial analyses of previously obtained down show that feather analysis appears to be a promising technique, we will attempt to find funding to examine long-term temporal change by analyzing feathers from museum specimens collected from 1860 to the present.

C. Location

Surveys of Resurrection Bay will be conducted primarily from Fox Island north with emphasis on determining the number of guillemots and the presence of any captive-raised birds at Cain's

Head, Thumb Cove and Humpy Cove. Observations of the nests at ASLC will be made by project and ASLC staff throughout the breeding season (May-August). Naked Island will be the site of a field camp that will be occupied intermittently during the summer by Shane Roy as he conducts his graduate studies and participates in the proposed research. Jackpot Island will be visited at least twice during the summer while Olga Bay, Sand Point and Juneau will be visited at least once with an additional visit if the situation warrants. Dutch Harbor and False Pass will be visited if the opportunity presents itself since both are known to support Pigeon Guillemot colonies under docks.

COMMUNITY INVOLVEMENT AND TRADITIONAL KNOWLEDGE

1. Community involvement

This project is based in the oil spill community of Seward. Two of the major entities involved in this project, ASLC and Pegasus Enterprises hold business addresses in Seward. Dr. French and the ASLC education staff have regularly involved the local and transient visitor populations in various aspects of previous ASLC Pigeon Guillemot research (EVOS Project 01327). We plan to enhance that interaction with a public education component of our proposed work.

The investigators and ASLC staff will conduct seasonal briefings of Kenai Fjords National Park personnel, including seasonal rangers, and employees of various cruise and charter boat companies. Additional presentations will be done as dictated by project evolution. Transportation for censusing and travel to colonies will involve cruise boats, U.S. Coast Guard vessels and other platforms of opportunity.

2. Public Education

Two intern positions will be shared between the project research and the ASLC Education Department. These interns will both participate in data collection and in the development of public education materials, the latter under the guidance of the Principal Investigators and the ASLC educational staff. Outreach efforts will focus on disseminating project results, enhancing awareness and appreciation of seabirds as indicators of the GOA environment, and communicating integrated GEM findings to the public. The emphasis will be on dissemination through ASLC but will include materials for the general public. Such materials may include, lectures, short courses, summary publications, visitor displays, and videotapes.

3. Traditional Ecological Knowledge

Through his former involvement on the PAG and the subsistence foods safety program, Dr. French has established community contacts throughout the affected area. We will use those connections to identify major changes in colony locations and to help optimize site selection for possible monitoring locations.

PROJECT DESIGN

A. Objectives

1. Determine the survivorship and recruitment of captive-raised Pigeon Guillemots fledged from the Alaska SeaLife Center in 1998-2000.
2. Examine the association of Pigeon Guillemots with man-made nest-sites and social arrays installed in Resurrection Bay and Prince William Sound in 1998-2000.
3. Examine the characteristics of extant Pigeon Guillemot colonies in man-made structures in the Gulf of Alaska to determine their breeding success, reasons for their occupation and potential as monitoring sites where numbers can be increased by creation of additional nest cavities.
4. Examine the utility of guillemot feathers as indicators of geographic and annual variability in the Gulf of Alaska by analyzing down and body feathers for delta C^{13} (as an indicator of productivity and/or geography), delta N^{15} (as an indicator of trophic position) and trace metals (as indicators of both contamination and geography).

B. Methods

Our proposed research will test the following basic hypotheses, which relate to the four primary objectives listed above:

Hypothesis 1. Captive rearing, caloric value of nestling diet, and oil ingestion by nestlings do not affect post-fledging survival or recruitment of Pigeon Guillemots at their natal location.

Hypothesis 2. Man-made nest sites and associated social attraction arrays are able to attract prospecting pairs and recruit breeding birds.

Hypothesis 3. Pigeon Guillemots breeding in man-made nest cavities have reproductive characteristics similar to those breeding in natural cavities.

Hypothesis 4. Chemical composition of Pigeon Guillemot feathers, as measured by isotopic and trace metal analysis, demonstrate geographic and annual variability in marine productivity, trophic level, and trace metal contamination.

Methodology employed by this project will consist of the following:

Objective 1. Survival and recruitment of captive raised birds

Surveys of Resurrection Bay will be conducted semi-monthly at two-week intervals from 15 May to 15 August. The purpose of the surveys will be to search for banded birds released as fledglings in 1998-2000 from the ASLC. 145 birds were released from the ASLC and with normal survival and philopatry over 50 birds should return as adults to northen Resurrection Bay. First breeding for guillemots is typically in years 3-4 so the majority of birds should recruit from 2002-2005. When a banded bird is observed during a survey its color-band combination will be noted and its position determined with a GPS. Preliminary information will be recorded on its plumage, social behavior with other guillemots, and attachment to any specific shoreline structure. When the survey is completed, or on the next day that weather permits, we will attempt to relocate the bird and determine breeding status (through its association with a nesting cavity) and sex (as indicated by position during copulation or other sex-specific behaviors). For birds

that are paired, whether breeding or not, we will determine whether the mate is a ASLC-fledged bird and if so will obtain its identity by reading the color-band combination. When an ASLC-fledged individual is associated with a nest box or natural cavity, we will attempt to access the site in order to determine if breeding is occurring. The contents of the nest (number of eggs or chicks), and their condition (size and state of incubation for eggs and mass and wing chord for chicks) will be obtained. When we find a site where nesting is occurring, we will attempt to obtain information on nest contents from the date of discovery until fledging occurs.

Objective 2: Association of Pigeon Guillemots with artificial nest boxes and social attraction arrays.

We will determine the attractiveness of Pigeon Guillemots to artificial nest boxes and decoys by conducting surveys of all natural and man-made colonies in northern Resurrection Bay. On semi-monthly boat surveys of all colonies north of Fox Island we will determine the number and distribution of birds on the water and in close proximity to natural and man-made nest sites. Our principal objective will be to determine if guillemots are recruiting to the artificial nest boxes installed from 1998-2000 but we will also obtain information on populations at natural colonies for comparison with data from 1999-2000. When we observe birds entering or leaving a nest box we will access the site at the earliest possible time to determine nest contents. The contents of the nest (number of eggs or chicks), and their condition (size and state of incubation for eggs and mass and wing chord for chicks) will be obtained. The access provided by the man-made nest sites will allow nest contents to be accessed more frequently than natural sites and active nests in man-made sites will be checked at least on every survey (twice monthly) with opportunistic visits when possible. We will attempt to determine if growth rate of chicks in artificial sites is comparable to that found in natural cavities.

In Prince William Sound we will examine two localities where next boxes for Pigeon Guillemots have been installed in the past, Jackpot and Naked islands. Shane Roy will be on Naked Island for much of the summer and will be monitoring the association birds with any of the nest boxes installed in 1996 and 2001. We will visit Jackpot Island in early July to determine the number of breeding birds and the occupation of man-made sites. A second visit will be made approximately a week before fledging begins to assess the productivity of both man-made and natural nest sites.

Objective 3. Characteristics of extant Pigeon Guillemot colonies in man-made structures

Docks with man-made cavities that are known to support successful breeding of Pigeon Guillemots will be visited to examine their physical structure and location (oceanographic characteristics of nearshore waters, proximity to guillemot or other seabird colonies, human activity). We will visit colonies in docks at Olga Bay, Sand Point, Juneau and Dutch Harbor where colonies of Pigeon Guillemots are known to occur. We will spend two days at each colony early period early in the incubation period (late June and early July) will record:

1. number of birds associated with the dock
2. number of active nest sites
3. nest contents and status (egg or chick size and stage of development)

3. physical characteristics of the active nest sites (size of cavity, distance of nest contents from site entrance, distance to nearest neighbor, light level at nest entrance and in next cavity).
4. Estimated number of available cavities that are not occupied.
5. Distance to other seabird colonies and species and number of breeding birds at these colonies.
6. Assessment of foraging conditions near the colony. This will include observations of feeding behavior and water clarity near the colonies and also bathymetry charts of the surrounding area.

Objective 4. Geographic and annual variation in the chemical compostion of guillemot feathers

In 1999 and 2000 Pigeon Guillemot chicks raised at the ASLC had down removed after it had been pushed out by the growth of feathers obtained during the nestling period. Because down is present on the chick at hatching it is reflective of the maternal condition. Yolk formation occurs in the 14 days prior to egg laying and the chemical composition of yolk reflects the prey the female consumes prior to egg laying. We have down collected from a total of 100 chicks hatched from eggs obtained in Juneau, Fool Island, Jackpot Island, and Kodiak Island.

For each locality and each year we will analyze the down from a maximum of five individuals. Isotopic analysis for delta C^{13} and delta N^{15} will be done at the Institute of Marine Science at the University of Alaska in Fairbanks. Trace metal analysis for mercury, cadmium and lead will be done through Frontier Geoscience in Seattle. The two analyses will be combined to allow determination of any variability in these isotopes and elements that could indicate annual or geographic variation in ecosystem structure or contamination.

F. Cooperating Agencies, Contracts and Other Agency Assistance

We will work with the Anchorage Office of Division of Migratory Bird Management of the U.S. Fish and Wildlife Service on all research conducted in Prince William Sound. That office has conducted Pigeon Guillemot research at Naked Island over the last 25 years and with post-spill censuses and breeding productivity assessment conducted annually since 1989. They have also conducted Pigeon Guillemot research at Jackpot Island. We will assure that our fieldwork at Naked islands be done so as to provide census or productivity data that is compatible with their long-term database.

Analysis of feathers for stable isotopes will be done under contract with Isotope Ratio Mass Spectrometry Laboratory at the Institute of Marine Science at the University of Alaska Fairbanks. Trace metal analysis will be done under contract to Frontier Geoscience in Seattle, Washington.

SCHEDULE

A. Measurable Project Tasks for FY 02 (October 1, 2001 B September 30, 2002)

October 1-30:	Submit previously gathered feathers for isotope and trace metal analysis.
January 15-30:	Conduct data analysis of feather composition data
February 1-15	Arrange logistics for censuses of PWS and visits to other GOA colonies
April 15	Submit annual report
May 15 - August 15	Semi-monthly surveys and nest checks of Resurrection Bay man-made nest sites, social arrays and colonies.
May 15 - 30	Pre-season surveys of Naked and Jackpot Islands for number of birds with maintenance of previously installed man-made nest boxes
June 1-August 15	Conduct observations of guillemots at natural and man-made sites on Naked Island
June 25:	Examination of nest boxes on Jackpot
July 15 - 30:	Visits to Olga Bay, Sand Point and Juneau
August 1-15:	Determination of nesting success in next boxes on Naked Island and
September 1:	Provide 2002 feathers to laboratories for analysis
December 15, 2003	Submission of annual report
January 31, 2003	Submission of manuscripts on objectives 3 and 4

B. Project Milestones and Endpoints

Objective 1. Survival of captive-raised chicks.

1 September - annual data gathering completed for Resurrection Bay

1 October - completion of analysis of nestling condition of resighted birds

Objective 2. Nest-box provisioning

1 September - annual data gathering completed

1 October - completion of analysis of nest site occupation

Objective 3. Assessment of extant man-made colonies

1 September - completion of assessment of sites

1 November - completion of analysis of characteristics of man-made colonies

Objective 4. Chemical composition of feathers

1 January - analysis of down and feathers complete

15 March - complete analysis of isotope and trace metal composition of feathers

1 June - complete first draft of manuscript on chemical composition of feathers

C. Completion Date

All fieldwork will be completed by September 2003 and a final report will be submitted by September 2003.

PUBLICATIONS AND REPORTS

The following publications are projected. This projection is approximate and should be considered incomplete. Annual reports will be submitted 15 April 2003 and 2003 with a final report submitted 15 December 2005.

A minimum of three manuscripts will be produced and submitted to peer reviewed scientific journals. Manuscripts anticipated at this time include: 1) the effects of captive rearing, diet treatments and oil dosing on survival to breeding in Pigeon Guillemots; 2) the utility of man-made nest cavities in creating colonies or increasing colony size to monitor Pigeon Guillemots; 3) chemical composition of Pigeon Guillemot feathers as indicators of ecosystem variability.

PROFESSIONAL CONFERENCES

Results of the research will be presented at the Pacific Seabird Group annual meeting in 2003 and 2004, typically held in February and March. The paper presented at the 2003 meeting will report on the results of guillemot feather analysis. The paper in 2004 will be on the survivorship of captive-raised released from ASLC.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Research in Resurrection Bay will attempt to incorporate volunteers, interns and staff from the ASLC in Seward. While no lab or office space is required at ASLC, we will work with the ASLC Director of Education and an intern working on this project to inform Center visitors of the goals of this project, including the importance of reporting any sightings of banded birds to ASLC or project personnel. In the spring of 2002 when the ASLC aviary will first have the possibility of having sexually mature guillemots of both sexes, a nest box will be placed in the aviary both to facilitate breeding and to educate the public on the utility of artificial nest boxes.

Analysis of resightings of captively raised birds will be done in cooperation with Dan Roby of Oregon State University (EVOS Project 01327) who is analyzing growth rates and blood parameters from the 1998-200 cohorts.

Research on Jackpot and Naked Island will be done in close cooperation with David Irons of the Anchorage office of the U.S. Fish and Wildlife Service's Division of Migratory Bird Management. That office has been conducting research on Naked Island since the mid-1970s and on Jackpot Island since the early 1990s. Their long-term data base on population size and productivity will be continued with the information obtained by the proposed research.

Trace metal analysis will be done so as to be compatible with the information needs of the Arctic Monitoring and Assessment Program (AMAP). The genus of Pigeon Guillemots (*Cepphus*) is a target genus of AMAP. Our data will be submitted to the appropriate AMAP data base, which when combined with data obtained by other countries, will allow a circumpolar assessment of contaminants in this genus. G. Divoky is a member of the EPA Heavy Metal Team that is working on the refinement of sampling protocols and analysis methods for arctic seabirds in general and guillemots in particular.

Opportunistic collection of Pigeon Guillemot eggs, chicks and adults will occur during the course of fieldwork when addled eggs or dead individuals are encountered. All tissue will be given to Geoff York of the Biological Research Division (BRD) of USGS for analysis or archiving in the tissue bank being developed by BRD and Paul Becker of NOAA.

PROPOSED PRINCIPAL INVESTIGATORS

John French is the sole proprietor of PEGASUS ENTERPRISES, a consulting company based in Seward, Alaska. He has a Ph.D. in Biological Chemistry from the University of Michigan. From 1980 to 1998, he was a faculty member at the University of Alaska, including ten years at the Fishery Industrial Technology Center, and five as the Director. He retired from the University in 1998 as a Professor of Seafood Biochemistry. While working for the University, he taught a variety of seafood and natural resource related courses as well as biochemistry and toxicology. He has successfully completed over two million dollars worth of grants and contracts, and published several peer reviewed manuscripts. Immediately following EVOS, he was the only Alaskan on NOAA's Toxicological Experts Panel which assessed, and assisted in communication of, the risks involved in consumption of subsistence foods from the spill area. He also served as an advisor to ADFG in communicating this information to residents of the villages within the effected area. He was the Science/Academic Representative on the EVOS-PAG from 1991-1995. He has lived and worked in Seward since 1998. He is a Founder Member of ASLC and supplied substantial volunteer assistance to the pigeon guillemot research there (#01327) during 1999 and 2000.

George J. Divoky is a Research Associate at the Institute of Arctic Biology in Fairbanks. He was Co-Principal Investigator on EVOS Project 01327 that raised and released Pigeon Guillemots from the ASLC and installed nest boxes and decoys in Resurrection Bay and Jackpot Island. He was an editor on the results of a workshop on seabird restoration and has been conducting research at a man-made colony of guillemots for two decades. He currently is investigating Black Guillemot breeding chronology and feather composition as indicators of global change.

OTHER KEY PERSONNEL

Shane Roy is a graduate student at Alaska Pacific University. In 2000 he participated in the raising and release of Pigeon Guillemots and in the installation of boxes and decoys in Resurrection Bay and Jackpot Island. In 2001 he will be conducting fieldwork on Pigeon Guillemots on Naked Island as part of his master's research.

Amy Haddow of the ASLC will supervise the interns when they are developing educational materials at the ASLC and will work with other project personnel in the creation of educational materials on seabirds and Pigeon Guillemots.

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FY 02 *EXXON VALDEZ* TR | **COUNCIL PROJECT BUDGET**

October 1, 2001 - September 30, 2002

Budget Category:	Authorized FY 2001	Proposed FY 2002	LONG RANGE FUNDING REQUIREMENTS
Personnel		$48,684.0	
Travel		$4,918.0	
Contractual		$15,802.0	
Commodities		$2,900.0	
Equipment		$0.0	
Subtotal	$0.0	$72,304.0	Estimated FY 2003
Indirect		$5,824.0	
Project Total	$0.0	$78,128.0	
Full-time Equivalents (FTE)		0.8	
	Dollar amounts are shown in thousands of dollars.		
Other Resources			

Comments:

j

FY02

Prepared:

Project Number: 02674-BAA

Project Title: Assessing Pigeon Guillemot restoration and feathers

Name: G.. Divoky and J. French

FORM 4A
Non-Trustee
SUMMARY

FY 02 *EXXON VALDEZ* TR : COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Personnel Costs:			Months	Monthly		Proposed
Name	Position Description		Budgeted	Costs	Overtime	FY 2002
George Divoky	Co-Princicpal Investigator		4.0	5670.0		22,680.0
John French	Co-Princicpal Investigator		3.0	7168.0		21,504.0
Shane Roy	Field assistant		3.0	1500.0		4,500.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		10.0	14338.0	0.0	
					Personnel Total	$48,684.0

Travel Costs:		Ticket	Round	Total	Daily	Proposed
Description		Price	Trips	Days	Per Diem	FY 2002
Seattle-Anchorage		330.0	3	15	45.0	1,665.0
Anchorage- Kodiak		350.0	1	5	135.0	1,025.0
Seward-Sand Point		352.0	1	5	135.0	1,027.0
Anchorage- Juneau		526.0	1	5	135.0	1,201.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$4,918.0

FY02

Project Number:
Project Title: Assessing Pigeon Guillemot restoration and feathers
Name: G.. Divoky and J. French

FORM 4B
Personnel
& Travel
DETAIL

Prepared:

FY 02 *EXXON VALDEZ* TI : COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Contractual Costs:		Proposed
Description		FY 2002
Air charter Seward-Jackpot	2 flights	1,600.0
Boat charter Whittier-Naked	2 trips	1,000.0
Vehicle rental		500.0
Housing in Seward		500.0
Telephone services		100.0
ASLC Interns	2 at $2001	4,002.0
Frontier Geosciences	trace metal analysis	6,500.0
Inst. Marine Science	isotope analysis	1,100.0
Food in Seward		500.0
	Contractual Total	$15,802.0

Commodities Costs:	Proposed
Description	FY 2002
Nest boxes	750.0
Camping gear	800.0
Field food	1,350.0
Commodities Total	$2,900.0

FY02

Prepared:

Project Number:
Project Title: Assessing Pigeon Guillemot restoration and feathers
Name: G.. Divoky and J. French

FORM 4B
Contractual & Commodities DETAIL

FY 02 *EXXON VALDEZ* TR : COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2002
			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:	Number	
Description	of Units	

FY02

Project Number:
Project Title: Assessing Pigeon Guillemot restoration and feathers
Name: G.. Divoky and J. French

FORM 4B
Equipment
DETAIL

Prepared:

Project Title: English Bay River Sockeye Salmon Enumeration Project

Project Number:	02677
Restoration Category:	General Restoration
Proposer:	Nanwalek I.R.A. Council
Lead Trustee Agency:	
Cooperating Agencies:	Chugach Regional Resources Commission and ADF&G
Alaska SeaLife Center:	
New or Continued:	New
Duration:	Two Years
Cost FY 02:	$ 170,100
Cost FY 03:	$ 102,700
Geographic Area:	South Central, Lower Cook Inlet/Outer Kachemak Bay
Injured Resource/Service:	Sockeye Salmon/Subsistence

ABSTRACT

This project will allow for improvements to and continuation of very important smolt and adult sockeye enumeration in the English Bay River drainage. Available funds have become scarce and the Nanwalek Salmon Enhancement Project has been forced to narrow down its focus on absolutely essential components of the project that result in adult returns. The enumeration of out-migrating smolts and returning adult sockeye escapement is very important to village project personnel and local ADF&G area management staff but without additional funding, these important tasks will not be able to continue. This project will help to improve our weir equipment and monitoring technology to enable more consistent and accurate data collection.

INTRODUCTION

The Nanwalek Salmon Enhancement Project (NSEP) officially began in 1990 when the Chugach Regional Resources Commission (CRRC) provided funding for the Alaska Department of Fish and Games (ADF&G), Fisheries Rehabilitation, Enhancement and Development Division (FRED), to develop a fry stocking program that would supplement wild fry production and help rebuild the depleted English Bay Sockeye run. The project has evolved into the present concept of taking eggs from English Bay Second Lake, incubating them in the nearby Port Graham Hatchery, transporting the emergent fry back to Second Lake for net pen rearing. They are reared all through the summer and fall and released late in the fall when competition with non enhanced stocks in the lakes would be at a minimum.

English Bay River sockeye adult salmon escapements have been monitored every year since 1927 with the exception of the four-year period from 1942 through 1946. Counts were made by weir from 1927 to 1941 and by aerial survey from 1947 to 1991. Prior to 1992, escapements were derived from peak or adjusted aerial counts based on conditions and time of survey. In 1985 the escapement dropped to 5,000 adult sockeye and the Alaska Department of fish and Game (ADF&G) closed the commercial and subsistence fisheries. The fishery was again closed from 1989 through 1994 due to low escapements. Recent years have seen increasing sockeye escapements estimated at 17,000 in 1994 (13,284 adults and 525 jacks actually counted), 22,500 in 1995, 13,380 in 1996, 15,426 in 1997, 15, 430 in 1998, 15,844 in 1999 and 12,613 in 2000. These higher escapements and their associated total adult returns are due, in large part, to the success of the Nanwalek Salmon Enhancement Project (NSEP).

Monitoring of the sockeye smolt out-migration was first started in 1988 (Edmundson et al. 1992 and Schollenberger, 1993) and has occurred every year since except 1989. The estimated corrected counts for these years was 49,253 in 1991, 52,091 in 1992, 54,664 in 1993, 85,287 in 1994, 275,436 in 1995, 23,000 in 1996, 225,398 in 1997, 54,135 in 1998, 48,065 in 1999 and 754,442 in 2000.

The NSEP project has focused on building up the returning adult sockeye run to optimal sustainable levels in order to support a strong local subsistence and local commercial set net fishery. Due to set backs from both disease (IHN) losses and a fire at the hatchery in Port Graham in 1998, the NSEP project is still a couple more years away from being able to generate enough funds through project cost recovery efforts to pay for all of the project operations. The egg take, incubation, transport and rearing operations are the most crucial to the projects success and available funds are being channeled to these essential project activities. The smolt and adult enumeration as well as the associated age, length and weight sampling from project weir operations are extremely important tasks. Due to lack of sufficient funding, this part of the project is not going to be able to proceed without additional help until anticipated project generated funds become available in 2003 when project adult returns should enable enough cost recovery to sustain the project from that point forward. The 2003 cost recovery funds will be received too late in the season to be available for that fiscal year and will be used for FY 2004 operations.

NEED FOR THE PROJECT

A. Statement of Problem

The English Bay Sockeye Salmon runs have been an important part of the local subsistence lifestyle since the ancestors of Nanwalek first arrived long ago. Since the inception of the Nanwalek Salmon Enhancement Project in 1990, the out-migrating smolts and the returning adult sockeye escapement have been regularly counted, sampled for age, weight and lengths and carefully monitored along with river levels, temperatures and the abundance of other migrating salmon and trout. This important practice is now in jeopardy due to lack of available funds. The Nanwalek Salmon Enhancement Project is still a couple of years from being able to generate enough funds from the projects cost recovery sales of surplus fish, to sustain operations with adequate funding. In response to having to tighten budgets to make ends meet, the NSEP project is now forced to spend limited financial resources only on absolutely critical projects that directly result in producing more adult salmon back to the village residents to meet local subsistence and commercial salmon fishing needs. The costs and operational logistics for egg take, incubation, and rearing are substantial in of themselves. The salmon project is now in the precarious situation of potentially not being able to continue the smolt and adult enumeration projects in FY 2002 and FY 2003 without financial assistance. Additionally, the project needs to upgrade aging smolt and adult weir materials that have washed out and been damaged repeatedly during high water events over the years and are becoming more and more problematic. A new smolt and adult weir is desperately needed to successfully enable the NSEP project to collect consistent and accurate enumeration data without the bothersome disruptions caused by blown out weirs during high water events. New technology is needed to provide more accurate data through the use of electronic smolt counters and a remote video system to observe the weir conditions and provide back up counts and be reviewed for regular enumeration use in the future.

B. Rationale/Link to Restoration

Sockeye salmon are one of the salmon species that sustained heavy damages from the EVOS spill. They are also the single most important subsistence species for the Tribal people of Nanwalek. The local native subsistence lifestyle is still rebounding from the damages and devastation of the spill. This project has a very strong connection to community-based monitoring through analysis of historical data component of the efficiency and comparative analyses reports that will be a part of the final documentation of this project. The project also has a solid connection with the EVOS Trustees guidance criteria regarding "Innovative Tools and Strategies to Improve Monitoring." This project is an ideal candidate for a cost-effective and highly efficient data acquisition system using new and improved technologies and improved sampling strategies that will be extremely helpful to local natural resource managers and personnel in Nanwalek, the Alaska Department of Fish and Game Area Management Biologist and staff as well as the EVOS Trustee Scientific Staff.

C. Location

The project is located in the English Bay River drainage and associated lakes near the Alutiiq native village of Nanwalek, Alaska (formerly known as English Bay). Nanwalek and the English Bay lakes (59° 20'N, 151° 45'W) are located near the southwestern tip of the Kenai Peninsula on lower Cook Inlet approximately forty kilometers southwest of Homer. The village is situated at the base of a narrow spit of land at the head of English Bay.

COMMUNITY INVOLVEMENT AND TRADITIONAL KNOWLEDGE

Nanwalek is working closely with the Chugach Regional Resources Commission and many of its own projects and programs on developing and optimizing community involvement opportunities on a variety of projects. We also work hard to implementing the traditional knowledge of our elders and subsistence users into the planning, reporting and decision making for many projects. The Nanwalek Salmon Enhancement Project has been a very successful community involvement project from the beginning and would never have gotten off the ground without the support of the community. A large percentage of Nanwalek residents have worked with the project in some capacity over the years. The project office is regularly visited by local residents who share observations, ideas and concerns with staff. Local traditional knowledge is regularly accessed and utilized. The NSEP project supervisor is a highly respected local elder. An example of the value and importance of utilizing traditional knowledge was demonstrated when local elders and resource users told project personnel that the adult sockeye run starts out with bigger fish and continually gets smaller over time. This seemed doubtful and unusual, but after reviewing the data and conducting more research, a very significant and consistent trend was shown to indeed be the case. This of course was no surprise to the local elders and resource harvesters and was simply a matter of fact.

PROJECT DESIGN

A. Objectives

Year One

1. Design, purchase materials and build a sturdy incline plane smolt weir.
2. Order and install electronic smolt counter.
3. Operate smolt weir for year one.
4. Design, purchase materials and build a floating free style resistance board adult weir.
5. Order and install a remote video camera system.
6. Operate adult weir for year one.
7. Produce annual report including an efficiency analysis of the new weir technologies used.

B. Methods

The construction of the incline plane smolt weir will be based on the design from Dick Crone of Northern Southeast Aquaculture Association, a well know expert in these systems. The materials for building and installing the weir will be ordered and it will be assembled and installed on site by local project personnel. Materials for building an adult floating free style resistance board style weir will be ordered based on a design used by Valdez Fisheries Development Association at their Solomon Gulch Salmon Hatchery. This weir will also be assembled and installed on site by local project personnel.

The electronic smolt counter will be a Smith Root model. The sixteen tunnel counter will be installed in the collecting box trap that the fyke net guides the smolt into and will count them as the exit the box trap back into the river. The unit will be regularly calibrated, cleaned and checked for accuracy. All data will be collected on field forms and transferred daily to project spreadsheets and emailed and or faxed to the ADF&G office in Homer.

The remote video system will be purchased and installed using a system that allows for a monitor back at the project office to show the image. This system will be based on a micro wave signal transmission and weather proof remotely controllable Hi 8 video camera such as systems used by Daniel Zatz and other commercially available systems. All of the images will be recorded on video tape which will be reviewed and processed for available data and information and either reused or archived depending on the imagery.

C. Cooperating Agencies, Contracts, and Other Agency Assistance

The Alaska Department of Fish and Game will be actively involved in this project and depends on the availability and accuracy of this enumeration data to help project future adult returns and more provide more efficient in season management.

Chugach Regional Resources Commission (CRRC) has been involved with this project from the beginning, providing administrative support, technical assistance and general project oversight. CRRC will assist the Nanwalek I.R.A. Council to administer the project and will provide technical assistance in the acquiring, building and installing the ideal technology to suite the needs of the project as well as the operations and maintenance of the new systems.

SCHEDULE

A. Measurable Project Tasks for FY 02 (October 1, 2001 – September 30, 2002)

Task #'s

1. Finalize design of incline plane smolt weir.
2. Purchase materials for smolt weir.
3. Build and assemble smolt weir.
4. Order and install electronic smolt counter.
5. Operate smolt weir for year one.
6. Finalize Design of floating free style resistance board adult weir.
7. Purchase materials and build weir.
8. Order and install a remote video camera system.
9. Operate adult weir for year one.
10. Produce annual report including an efficiency analysis of the new weir technologies used.

B. Project Milestone and Endpoints

Task #	Date Task Completed	Measurable Endpoint
1.	December 2001:	Incline Plane Smolt Weir Design & Sources
2.	March 2002:	Materials on site
3.	April 2002:	Incline Plane Smolt Weir Installed and Operational
4.	February/April 2002:	Electronic Smolt Counter Installed and Operational
5.	April 15th to July 30th, 2002:	Complete spreadsheet records of counts & AWL's
6.	February 2002 :	Resistance Board Weir Design and Sources
7.	April/May 2002:	Resistance Board Weir Installed and Operational

Task # 8:	April/May 2002	Remote Video System on Line
Task # 9:	May 15th – Aug. 30th, 2002	Complete spreadsheet records of counts & AWL's
Task # 10:	September 2002	Complete Annual Report and Efficiency Analysis.

C. Completion Date
September 30th, 2003

PUBLICATIONS AND REPORTS

The Annual Report will describe the operations of the new weir systems complete with a comparative and efficiency analysis to demonstrate measurable improvements in data accuracy and consistency. The Final Report will include an efficiency and comparative analysis section to review and document the impacts of the new equipment and technology on any changes or improvements regarding consistency and accuracy in juvenile and adult Sockeye enumeration.

PROFESSIONAL CONFERENCES

A presentation on this project will be presented at the Annual Native American Fish and Wildlife Society Conference in the fall of 2003 and at the Alaska Hatchery Managers Meeting in January of 2004.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

This project will be integrated with other EVOS trustee restoration efforts of impacted Sockeye Salmon in the Cook Inlet area. The Alaska Department of Fish and Game will be directly involved in assisting with the coordination and review of this project.

PROPOSED PRINCIPLE INVESTIGATOR

Carol Kvasnikoff
Nanwalek Salmon Enhancement Project Coordinator
P.O. Box 8078, Nanwalek, Alaska 99603-8853
907 281-2275
907 281-2275
nsep@ptialaska.net

PRINCIPAL INVESTIGATOR
Carol Kvasikoff

OTHER KEY PERSONNEL
Mike Tanape, Project Supervisor
Wally Kvasikoff, Assistant Project Supervisor
Elmer Anahanok, Crew Leader
Macky
Herman?
Sargus?

LITERATURE CITED

FY 02 *EXXON VALDEZ* TRU : COUNCIL PROJECT BUDGET

October 1, 200 eptember 30, 2002

Budget Category:	Authorized FY 2001	Proposed FY 2002	
Personnel		$54.2	
Travel		$4.8	
Contractual		$27.0	
Commodities		$1.2	
Equipment		$67.4	LONG RANGE FUNDING REQUIREMENTS
Subtotal	$0.0	$154.6	Estimated FY 2003
Indirect		$15.5	
Project Total	$0.0	$170.1	$102.7
Full-time Equivalents (FTE)		1.7	
			Dollar amounts are shown in thousands of dollars.
Other Resources		$36.0	$36.0

Comments: Indirect costs are based on 10% to cover Nanwalek I.R.A. Council Project Administration and Oversight.
Other resources include in kind project personel, weir site equipment and land use access leases.
Approximately 5% of the project personell costs will be used for preperation of project presentations at the annual Native American Fish and Wildlife Conference and the Alaska Hatchery Managers meeting upon completion of the project.

FY02

Prepared:

Project Number: 02677
Project Title: English Bay River Sockeye Salmon Enumeration Project
Name: Emily Sweening, Chief Nanwalek I.R.A. Council

FORM 4A
Non-Trustee
SUMMARY

FY 02 *EXXON VALDEZ* TRU : COUNCIL PROJECT BUDGET

October 1, 200 eptember 30, 2002

Personnel Costs:			Months	Monthly		Proposed
	Name	Position Description	Budgeted	Costs	Overtime	FY 2002
	Carol Kvasnikoff (PI)	Project Coordinator	4.0	3.1		12.4
	Mike Tanape	Project Supervisor	4.0	2.8		11.2
	Walley Kvasnikoff	Crew Leader	3.0	2.7		8.1
	Elmer Anahanak	Fisheries Technician	3.0	2.5		7.5
	Technician	Fisheries Technician	3.0	2.5		7.5
	Technician	Fisheries Technician	3.0	2.5		7.5
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	20.0	16.1	0.0	
					Personnel Total	$54.2

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FY 2002
	12 RT Homer to Nanwalek	0.1	12	36	0.0	1.2
	4 RT Anchorage to Nanwalek	0.3	4	8	0.0	1.2
	2 RT Nanwalek to Juneau for Hatchery Managers Meeting	0.4	2			0.8
	2 RT Nanwalek to Seattle for Native American Fish and Wildlife Conf.	0.8	2			1.6
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$4.8

FY02

Prepared:

Project Number:
Project Title: English Bay River Sockeye Salmon Enumeration Project
Name: Emily Sweening, Chief, Nanwalek I.R.A. Council

FORM 4B
Personnel
& Travel
DETAIL

FY 02 *EXXON VALDEZ* TRU : COUNCIL PROJECT BUDGET

October 1, 20C eptember 30, 2002

Contractual Costs:	Proposed
Description	FY 2002
CRRC Administrative Assistence	15.0
CRRC Technical Assistance including professional fisheries biologist	12.0
Contractual Total	$27.0

Commodities Costs:	Proposed
Description	FY 2002
Rope and Cable	0.4
River Bed Anchors	0.6
Video Tapes	0.2
Commodities Total	$1.2

FY02

Prepared:

Project Number:
Project Title: English Bay River Sockeye Salmon Enumeration Project
Name: Emily Sweening, Chief, Nanwalek I.R.A. Council

FORM 4B
Contractual & Commodities DETAIL

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2002
Incline Plane Smolt Weir	1	25.0	25.0
Electronic Smolt Counter	1	10.0	10.0
Floating Aluminum Resistence Board Weir	1	20.0	20.0
Remote Video Monitoring/Couniting System	1	12.0	12.0
Quanset Style Weir Tent	1	0.4	0.4
			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**	$67.4

Existing Equipment Usage:	Number
Description	of Units
Old Smolt Weir, with leads, fyke nets and box traps	1
Electronic Adult Counting Tunnel	1
Adult Picket Weir	1
Generator for Weir Tent Power	1

FY02

Prepared:

Project Number:
Project Title: English Bay River Sockeye Salmon Enumeration Project
Name: Emily Sweening, Chief, Nanwalek I.R.A. Council

FORM 4B
Equipment
DETAIL

02677

STATE OF ALASKA

TONY KNOWLES, GOVERNOR

DEPARTMENT OF FISH AND GAME

DIVISION OF
COMMERCIAL FISHERIES

Homer Office
3298 Douglas Place
HOMER, AK 99603-8027
PHONE: (907) 235-8191
FAX: (907) 235-2448

April 12, 2001

Nanwalek IRA Council
P.O. Box 8028
Nanwalek, AK 99603

Dear Nanwalek IRA Council:

With the 2001 salmon fishing season nearly upon us, I felt it prudent to contact you via this letter to discuss ADF&G's plans for management of the fisheries in the vicinity of the English Bay Lakes drainage. As you are likely aware, the preseason forecast for sockeye salmon returning to the lakes is much lower than the past several years, with a total projection of less than 8,000 fish. This figure falls below both the desired (15,000) and minimum (10,000) sockeye escapement goals established for the English Bay Lakes system. Hence, the commercial, sport, and subsistence fisheries in Port Graham Subdistrict, including the English Bay Section, will be closed beginning June 1 and will remain closed until the sockeye return is over.

The projected low return, coupled with the lack of a commercial or subsistence fishery, underscores the Department's needs to collect consistently accurate and timely data on the sockeye return to English Bay Lakes in order to make inseason adjustments to the management strategy. Such information includes daily escapement counts from the beginning of the return in late May/early June until the end of the return in July. The adult counting weir project, operated by the Nanwalek Sockeye Enhancement Project since 1994, has been invaluable to the Department's management of the fishery by providing such counts. Through this project, the Department is better able to monitor escapement rates and therefore gauge the strength of the return. I cannot over-emphasize the importance of receiving this information in a timely manner, i.e. on a ***daily basis***. Without this essential information, the Department has little data with which to make informed management decisions.

Another tool that is important to the evaluation and forecast of English Bay sockeye salmon is the smolt outmigration counting weir, also operated annually by the Nanwalek Sockeye Enhancement Project. The data collected as a result of this project is used to assess the success of both the enhanced and wild segments of the sockeye populations in the lakes, as well as to project future adult returns. The vital information collected from this project is critical to the continued refinement of the enhancement program to ensure long-term success. Additionally, the annual forecast provides fishermen, the industry, and the Department with information necessary to effectively plan for their activities in a given year.

I urge you to support the efforts of the Nanwalek Sockeye Enhancement Project to continue the operation of the smolt/adult weir project. This should not be viewed as a "short-term" endeavor, but rather as a permanent tool to gather essential information that will ultimately benefit the sockeye salmon resource as well as all affected users of this resource. I encourage you to help secure the funding necessary to continue operation of these projects on an annual basis. I hope you will agree that these projects provide a valuable service to a variety of different people and organizations.

If you have questions or comments regarding the Department's programs, please feel free to write, call, or email me at your convenience.

Sincerely,

Lee F. Hammarstrom
Area Finfish Management Biologist
Lower Cook Inlet
email *lee_hammarstrom@fishgame.state.ak.us*

cc: C. Kvasnikoff

NANWALEK IRA COUNCIL

P.O.BOX 8048
NANWALEK, ALASKA 99603

Phone 281-2274
Fax 281-2252

RESOLUTION NO. 01-07

A RESOLUTION TO SUBMIT A GRANT PROPOSAL TO THE EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL FOR THE NATIVE VILLAGE OF NANWALEK AND THE NANWALEK SALMON ENHANCEMENT PROJECT

WHEREAS, the Nanwalek IRA Council is the governing tribal body for the Native Village of Nanwalek and is comprised of seven council members; and

WHEREAS, it is the goal of the IRA Council to perpetuate and enhance the traditional way of life, as well as create jobs and an economy that will sustain the traditional way of life, and

WHEREAS, the Nanwalek IRA Council has been conducting the Nanwalek Salmon Enhancement Project since 1990. From that time it has grown into a full-fledged enhancement project producing returns between 30,000 and 50,000 sockeye salmon per year, and in the future peak around 100,000 per year. The project helped to restore subsistence fishing as well as a limited commercial fishery 100,000 per year. The project helped to restore subsistence fishing and a local limited commercial fishery in the surrounding area; and

WHEREAS, the Nanwalek IRA Council's intent is to improve the efficiency of the Nanwalek Sockeye Enhancement Project operation by continuing to study the outmigration of both wild and project enhanced sockeye smolt to help determine the fry to smolt survival rate and to more efficiently project the number returning adult sockeye salmon; and

WHEREAS, the Nanwalek Sockeye Salmon Enhancement Project provides support for our subsistence fishery which is a critical part of our traditional way of life, and also supports our commercial fishery, which provides economic development; and

WHEREAS, the Nanwalek Sockeye Salmon Enhancement Project help to maintain accurate records of adult sockeye escapements which allows optimum in season management of the returning adults by operating its adult weir; and

WHEREAS, it is not uncommon for high water events to result in periodic washouts of the smolt and or adult weirs, causing important data to be lost; and

WHEREAS, an incline plane style smolt weir and a floating resistance board adult weir will help insure constant and accurate enumeration; and

WHEREAS, the Nanwalek IRA Council is concerned with the safety of the current weir during flooding conditions.

NOW THEREFORE BE IT FURTHER RESOLVED, the Nanwalek IRA Council authorizes the Chugach Regional Resources Commission to administer the grant through an administrative service contract that addresses the necessary forms to start the project, maintain all financial records, prepare and submit required reports to the Exxon Valdez Oil Spill, prepare and submit request for payment, and coordinate and oversee the annual audit of the project.

BE IT FURTHER RESOLVED, that the Nanwalek IRA Council is hereby authorizing the Chugach Regional Resources Commission to initiate all action necessary to successfully carry out all project objectives as listed in the proposal and sign all documents necessary to finalize the grant process; and

BE IT FURTHER RESOLVED, a condition of authorization, on behalf of the village be said, the Nanwalek IRA Council requires from CRRC quarterly financial and progress reports of the project.

CERTIFICATION

I, the undersigned, as president of the Nanwalek IRA Council, hereby certify that the Council is comprised of seven members, that the foregoing resolution was adopted by the affirmative vote of __ for, ___ against, ___ abstaining, and that the foregoing resolution has not been rescinded or amended in any way.

Emilie Swenning 4/13/01
Emilie Swenning, Chief Date

Attest: [signature] 4-13-01
[illegible] Date
James R. Kvasnikoff, 2nd Chief

Bycatch for science: identifying community-based ways to use commercial fisheries bycatch for scientific gain (submitted under the BAA #52ABNF1000031)

Project number:	02678-BAA
Restoration Category:	Research
Proposer:	William J. Wilson, LGL Alaska Research Associates, Inc, Anchorage, Alaska.
Lead trustee agency:	LGL
Cooperating agencies:	Milton Love and Catherine Mecklenburg (University of California-Santa Barbara); Lyman Thorsteinson, (U.S. Geological Survey, Seattle, WA); David Roseneau, (U.S. Fish and Wildlife Service, Homer, AK);
Alaska SeaLife Center:	
Duration:	First year, 1-year project
Cost FY 2002:	$120,000
Geographic area:	Southcentral Alaska (Gulf of Alaska)
Injured Resource / Service:	Non-commercial fish communities in the Gulf of Alaska

ABSTRACT

This project will investigate the feasibility of using commercial fisheries bycatch to increase scientific knowledge of rare and infrequently-studied icthyofauna in the Gulf of Alaska. Initial efforts will include a comprehensive overview of commercial fisheries, vessel types, seasons, and locations most likely to yield regional bycatch samples useable for scientific purposes. Pilot research will be conducted with selected members of the fishing community to develop a statistically-valid experimental design at appropriate spatial scales. Sampling protocols will then be conducted to field-test the design. Additional methods and procedures will be described for the identification, preservation, and vouchering of specimens. Methods for data analysis and reporting of geospatial data will also be described. A final report will evaluate the sampling protocol and specify a future full-scale study design.

INTRODUCTION

Bycatch of untargeted species during commercial fishing operation is one of the most widespread problems in the fishing industry. Excessive bycatch of incidental (retained catch of non-target species) and discarded fish can have negative conservation and social repercussions (NMFS 1997). Excessive bycatch of non-target species can have detrimental economic impacts if the bycatch counts against the harvest allocation for that species in another season, or when it causes the target fishery to be closed to protect the non-target species. Bycatch can also be detrimental to the fish community when it inadvertently causes the overharvest of a species or population. The potentially negative impacts of bycatch has caused it to receive increasing scrutiny in recent decades as researchers, managers, and the fishing industry attempt to minimize bycatch and its effects.

Despite the problems associated with the bycatch of commercial fisheries, it may also present a unique opportunity for the advancement of scientific knowledge. Fish species that are commercially unimportant receive relatively little research funds, resulting in a dearth of knowledge of their life histories, ranges, and population dynamics. Although these species may be commercially unimportant, they are often integral to their food web and ecosystem. Consequently, the lack of research funds on these species may hinder their management, thereby increasing the possibility that ecologically important declines and perturbations go unnoticed by resource managers. Many such species, however, are captured as bycatch in groundfish fisheries of the Gulf of Alaska. As such, bycatch often represents the best opportunity to collect and study these species. Given the usual lack of funding to study these species and their relative availability as bycatch, sampling protocols that opportunistically sample bycatch could make substantial and efficient contributions to the understanding of marine ecosystems.

A scientifically rigorous, opportunistic sampling program that relies on community involvement would mesh well with the transition from the damage assessment and restoration program of EVOS to the long-term monitoring program of GEM. EVOS

generated substantial data on species life histories and ranges; GEM will emphasize the long-term monitoring of the ecosystem on which EVOS studies focused. A successful feasibility study of the efficacy of bycatch sampling would synthesize data generated by EVOS and other studies, then devise sampling designs that would contribute to GEM's ability to establish long-term ecosystem monitoring. Because it simply harnesses existing collection efforts (commercial fishing) instead of launching new ones, an opportunistic, scientifically rigorous bycatch sampling program has the potential to yield high quality, unusual data in a cost-effective, efficient manner. If the protocols developed by the proposed study prove effective, an expanded sampling program that can be expanded upon in future years could be a substantial contribution to the long-term vision of GEM.

NEED FOR THE PROJECT

A. Statement of Problem

It is clear from the "Fishes of Alaska" (Mecklenburg et al., in prep) publication that many species in the Gulf of Alaska remain poorly known within the ecosystem context required by resource management. Although most economically-important fishes have received considerable scientific scrutiny, little or no attention has been paid to most other species. This proposal is to research scientific methods and community involvement that will help increase our understanding of these species and their roles in regional biodiversity and the marine ecosystem. Without this information, it impossible to understand community structure and functioning at ecosystem levels (i.e., Gulf of Alaska) or smaller spatial scales (i.e., Prince William Sound). Biological information obtained from fisheries bycatch will provide access to poorly represented species. When viewed within the context of the entire Gulf Ecosystem Monitoring effort, this information will provide additional insights into the role of perturbations, natural and anthropogenic, as agents of environmental change. Supplemental samples will be obtained from other, directed research efforts in the study area (e.g., seabird oceanography – marine mammal cooperative investigations).

B. Rationale/Link to Restoration

A substantial portion of current knowledge of marine fish ranges in the Gulf of Alaska came from biological examination of fish specimens. The majority of verifiable range documentations are from species that were collected prior to the Exxon Valdez Oil Spill, thus providing resource managers with a reliable baseline from which to evaluate temporal and spatial patterns at differing levels of biological organization.

This proposal to study bycatch will provide access to rare and under-studied species from which inventory, taxonomic, and population information can be extracted. Voucher specimens will be properly identified and maintained at the University of Alaska in a cooperative effort to build an Alaskan reference collection, a research tool that has been neglected for too long. Commercial fishing communities will be integral to the project because fishers will be the principle source of specimens for study and archival. If implemented, the bycatch monitoring program will build (1) community support for science-based, ecosystem management, (2) increased understanding of regional biota, and (3) scientific knowledge about how regional ecosystems respond to environmental change.

C. Location

The project will evaluate the feasibility of using bycatch from fisheries in Prince William Sound and adjacent waters in the Gulf of Alaska in a long-term monitoring design. Fishers participating in commercial fisheries based out of Kodiak will be selected to participate in protocol development objectives of the proposed research. This study area includes the fishing area affected by the Exxon Valdez Oil Spill. The project will include a broader, regional focus, however, as we will seek to include interested members of

established fishing communities throughout the northern Gulf of Alaska. The final monitoring design is expected to involve greater community participation and greater ecosystem coverage. The approach proposal is a pilot effort to develop and test methods, evaluate community interest, and to serve as "proof of concept" in bycatch values for science (e.g., inventory, taxonomy, ecosystem studies). We believe that a Gulf of Alaska ecosystem design, with subset domains, is consistent with NOAA-Fisheries resource management perspectives on Very Large Marine Ecosystems.

COMMUNITY INVOLVEMENT AND TRADITIONAL KNOWLEDGE

Developing partnerships between the scientific, resource management, and fishing communities is central to this project. Commercial fishing groups and individuals will be contacted to determine the locations, times, and gear types that are most likely to yield intact pelagic or demersal fish samples and quality specimens for preservation. The investigators will work with members of the fishing industry to identify individuals willing to collaborate in monitoring phases of the project and assist with information transfer and outreach objectives. The investigators have extensive contacts with fishers in the major fishing ports in the Gulf of Alaska. Community involvement will also include working with scientists to procure, preserve, and transport specimens. Scientific involvement will include educational outreach, training in sampling procedures, and feedback of results to those involved. The final report and recommendation for future study designs will be developed in conjunction with community members, thereby ensuring that a viable partnership between scientists and community members is in place from the outset.

PROJECT DESIGN

A. Objectives

1. To identify sources of bycatch information (fisheries, vessels, and community partners) that can increase scientific knowledge of regional biota within the Gulf of Alaska ecosystem. Such information includes a synthesis of the NMFS trawl survey database.

2. To develop and test sampling protocols to collect, identify, and preserve fish specimens acquired in the bycatch of regional fisheries for scientific inventory and monitoring.

3. To recommend an experimental design for a GEM monitoring program using bycatch to evaluate environmental change in the Gulf of Alaska ecosystem.

B. Methods

Pilot Study

The investigators will identify fishing community members willing to assist with identifying fisheries likely to yield bycatch for science purposes. Key initial contacts will include Community Facilitators listed by the EVOS Trustee Council, Regional Advisory Council members identified by the Office of Subsistence Management, and stakeholder groups such as Cordova District Fishermen United. The investigators and community members will form a review team to evaluate fishing seasons, locations, and gear types to identify those with the best chance of yielding intact and preserveable specimens. This team will review and synthesize data and information from past NOAA-Fisheries resource assessment surveys and the Marine Observer Program, and range/species descriptions in the "Fishes of Alaska" volume to further assist and refine the evaluation. The investigators will also describe sampling methods, results, and applications that can be realistically addressed with bycatch samples. In addition to the inventory and taxonomic possibilities already mentioned, the value of a bycatch monitoring program to evaluation of environmental change and existing management strategies (e.g., Essential Fish Habitat) will be discussed. Our biodiversity goals will include description of benthic fish assemblages, collection of rare or poorly-understood

species, age and growth data, and various other life history, population, and community information from these species.

The review team will identify commercial fishers willing to assist with bycatch collection. The investigators will then work in partnership with one or more of these fishers to devise, test, and recommend an effective sampling program. Considerations will include sampling locations, frequency, whether to use vessel crew or a biologist for initial bycatch sorting, and how to preserve and transport specimens to port. Once in port, the bycatch will be sorted and classified by our team of experienced taxonomists (Love and Mecklenburg); the specimens may be shipped to a laboratory or university for further study and archival. Specimen preservation and initial processing in Kodiak will be based from industry or university freezer facilities, depending on needs identified while developing the study.

The fishing partners and accompanying scientists will test the sampling protocol in field research conducted from at least one vessel and fishery. We anticipate the program to proceed as follows:

Bycatch sampling and sorting. Depending on cost, complexity, and time requirements, the initial sorting will be done by the crew and project biologist traveling aboard the vessel. Day trips or short, several-day trawls will be targeted.

Specimen preservation and transport. Vessels will need to either return to port frequently, or have sufficient space on board for specimen preservation. Minimum requirements will include dedicated freezer space.

Onshore processing and shipping. If possible, specimens will be landed at ports with scientific laboratories such as in Kodiak or other communities with industrial storage, processing, and shipping facilities.

Final sorting and classification. Depending on complexity and the resolution needed, specimens will be processed by the LGL project biologist at the landing facility, or by taxonomic experts on the scientific party (Mecklenburg and Love).

Data analysis and results synthesis. LGL biologists will perform the initial data analysis, then meet with the collaborators to synthesize results and evaluate the efficacy of the overall study design for long-term monitoring using bycatch and specimen collections from fisheries and other ongoing research programs. LGL will then take the lead preparing a final report that describes and evaluates the bycatch sampling protocol, develops a strategy for using fishers in a long-term monitoring design, and describes community feedback and information transfer objectives of the proposed monitoring program.

Community Assistance. Training of local fishers in sampling protocol will be an important component of this project. The relevance of bycatch research to science, resource management, and the fishing industry will be prioritized. Other informational benefits from this project will include increased understanding of biodiversity, supplements to the Alaskan reference collection, essential fish habitat evaluations, and general ecosystem monitoring to fulfill some of the long-term objectives of GEM.

C. Cooperating Agencies, Contracts, and Other Agency Assistance

Dr. Milton Love (805) 893-2935 and Catherine W. Mecklenburg (907) 789-7603
(University of California-Santa Barbara);
Lyman Thorsteinson (206) 220-4614 (U.S. Geological Survey);
David Roseneau (907) 235-6546 (U.S. Fish and Wildlife Service)

SCHEDULE

A. Measurable Project Tasks for FY 02

September – December 2001: Synthesize data from EVOS, NMFS, other sources

December 2001:	Collaborators identify target fisheries, species, and community partners
January – March 2002:	Sampling protocols and data goals developed
April – July 2002:	Bycatch sampling, sorting, and processing
May – July 2002:	Data analysis
August – September 2002:	Production of final report

B. Project milestones and endpoints

1. Identify and synthesize sources of bycatch information:	December 2001
2. Develop and test sampling protocols:	July 2002
3. Recommend future study designs:	September 2002

PUBLICATIONS AND REPORTS

Final report "Bycatch for science: an evaluation of an introductory sampling program and recommendations for future applications".

Draft manuscript "Using bycatch for science and long-term monitoring" will be developed for submission to Fisheries.

PROFESSIONAL CONFERENCES

2002 American Fisheries Society Annual Meeting, Alaska Chapter.
Other conferences and proceedings as warranted.

NORMAL AGENCY MANAGEMENT

Not applicable because lead investigator is not a government agency.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Biology of underutilized species will have ecosystem considerations for higher level apex consumers studied by GEM (e.g., pelagic life histories of species that nourish mammals and birds). The Alaska reference collection (UAF) will gain specimens that will benefit future environmental research investigations in the Gulf of Alaska. The long-term monitoring design envisioned will allow data analysis to occur at local and ecosystem scales. Achieving scientific defensibility in some commercial fishing catches will allow comparisons to be made with historical scientific catches such as the NMFS trawl surveys. Geospatial data sets will be available to other GEM investigators for GIS presentation and other uses.

If funded, the project will be coordinated with a project entitled "Evaluating the Feasibility of Developing a Community-Based Forage Fish Sampling Project for the Evos GEM Program", a forage fish study proposed by David G, Roseneau, U.S. Fish and Wildlife Service Alaska Maritime NWR, Homer, Alaska.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

Not applicable, new proposal.

PROPOSED PRINCIPAL INVESTIGATOR

William J. Wilson
LGL Alaska Research Associates, Inc.
1101 E. 76th Ave, Suite B
Anchorage, AK 99518
Phone: (907) 562-3339
Fax: (907) 562-7223
Email: bwilson@lgl.com

PRINCIPAL INVESTIGATOR

William J. Wilson is a senior marine biologist in LGL's Anchorage office. He also is Managing Director of LGL's Alaska Operations. He has over 28 years of experience as an environmental scientist specializing in fishery research and management, nearly all of which have been in Alaska. Mr. Wilson was a research scientist with the University of Alaska from 1974 to 1988 where he conducted many applied environmental research projects across Alaska. From 1988-1990, he was the Gulf of Alaska groundfish plan coordinator for the North Pacific Fishery Management Council. He coordinated the annual cycle of groundfish fishery management analyses by the plan team, other Council staff, and scientists with the Alaska Fisheries Science Center (NMFS).
Over the past ten years, Mr. Wilson has worked on Alaskan North Slope environmental assessments of oil and gas industry operations, including seismic exploration and offshore development, and he has managed several large multi-disciplinary studies for industry. He recently managed LGL's forage fish studies in Cook Inlet/Shelikof Strait for the Minerals Management Service. He also has worked to develop approaches for conducting cumulative impact assessments of development on Alaskan biological resources. Finally, Mr. Wilson is chairman of the American Fisheries Society's "fish key committee" where he has worked with a contractor and the Biological Resources Division of USGS since 1990 to complete a comprehensive key to the fishes of Alaska.

OTHER KEY PERSONNEL

Dr. Milton Love is an Associate Research Biologist at the Marine Science Institute at the University of California at Santa Barbara. Dr. Love has authored several books on fishes of the Pacific Coast, and dozens of technical and peer-reviewed papers on marine fish and ecology. His current research includes studies of early life history of fish, rocky reef fishes, and identification of critical marine habitat for populations rehabilitation. Dr.

Love is an accomplished science writer, and has authored over a hundred projects on marine science in multiple media. As one of the world's preeminent authorities on fishes of the Pacific, Dr. Love will serve as the lead taxonomist for this project.

Mr. David G. 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. He joined the U.S. Fish and Wildlife Service in January 1993, and was project leader for EVOS-sponsored common murre restoration studies at the Barren Islands during 1993-1994 (Projects 93049 and 94039). Mr. Roseneau was also principal investigator of the 1995-1999 APEX Barren Islands seabird and large fish as samplers studies (Projects 95163J, 95163K, 96163J, 97163J, 97163K, 98163J, 98163K, 99163J, and 99163K), and the 1996-1997 and 1999 Barren Islands and 1998 Chiswell Islands common murre population monitoring projects (Projects 96144, 97144, 98144, and 99144). Currently, he is principal investigator for the 2001 Chiswell Islands common murre population monitoring project (Project 01144). Mr. Roseneau is experienced in collecting and analyzing various forage fish data, and has designed and successfully tested a new technique for sampling capelin (Mallotus villosus) and Pacific sand lance (Ammodytes hexapterus) by using stomach contents from sport-caught Pacific halibut (Hippoglossus stenolepis). During his career, Mr. Roseneau has authored and co-authored 100 reports and publications, including 33 on Alaskan seabirds and 5 on a new sampling technique for capelin and sand lance.

Mr. Lyman Thorsteinson is currently the Deputy Center Director, Western Fisheries Research Center in Seattle, Washington. He has been a fishery biologist and research manager of numerous Alaska fishery and environmental projects since 1978 with NOAA's Outer Continental Shelf Environmental Assessment Program, National Park Service, National Biological Service and U.S. Geological Survey. He has been a commercial fisherman in southeast Alaska and has worked with other key personnel identified on various marine biodiversity projects on the West Coast and Alaska. His role in this project will be one of technical advisor and coordination (in kind support). Ms. Katherine Mecklenburg

Ms. Catherine W. Mecklenburg is a specialist in taxonomy and fish identification. For the past 10 years, sponsored mainly by the U.S. Geological Survey, Biological Resources Division, her major preoccupation has been conducting research for and writing a book, *Fishes of Alaska* (approx. 1,100 pages, more than 1,500 illustrations of fishes, 600 range maps). The book is scheduled to be published this summer by the American Fisheries Society. Ms. Mecklenburg is an independent investigator, carrying out research, writing, and editorial work in ichthyology and fisheries biology under contract to government agencies and universities as co-owner of Point Stephens Research located north of Juneau, Alaska. She has operated this Alaskan business with her husband and colleague, T. Anthony Mecklenburg, since 1979. She also has a part-time position as Associate Specialist with the University of California Santa Barbara, Marine Science Institute. Prior to independent work, Ms. Mecklenburg held positions as Writer/Editor for the State of Alaska Office of Coastal Management, Biological Sciences Editor for the National Marine Fisheries Service Auke Bay Laboratory, Fisheries Biologist with the Alaska Department of Fish and Game, and Assistant Professor of Anthropology specializing in taxonomy and anatomy at the University of Alaska Fairbanks. Her graduate work was done at the University of Washington, Seattle, and University of Massachusetts, Amherst, and undergraduate work at The American University, Washington, D.C.

Ms. Mecklenburg's ichthyological research has involved review of an enormous body of literature on Alaskan fish taxonomy, from the early, original descriptions of species published in the 1800s to the present. She is currently involved in several projects involving taxonomy of Alaskan fish species, and will present results of two studies at the annual meeting of the American Society of Ichthyologists and Herpetologists this coming July. Ms. Mecklenburg has begun preparation of computer keys to the fishes of Alaska for use on laptop computers by fishermen, biologists, and naturalists.

Mr. Matt Nemeth conducted his Master's research at Cornell University prior to joining LGL as a fisheries biologist in 2000. Mr. Nemeth's research has focused on the effects of genetic and environmental variables on life history differences among fish populations,

on habitat selection and preferences, and on fish migratory behavior. Mr. Nemeth has managed multi-year fisheries projects, and will coordinate the onsite operation of the field work and report preparation of this project. Mr. Nemeth also has experience working with the commercial fishing industry, both as a full-share crewman on commercial pot-fishing vessels and as an Observer for the State of Alaska.

LITERATURE CITED

Mecklenburg, C. W., et al. 2001 (in prep). Fishes of Alaska. American Fisheries Society, Bethesda, MD.

NMFS. 1997. Bycatch: A national concern. U.S. Department of Commerce, national Oceanic and Atmospheric Administration, Silver Spring, MD.

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Love, M. 1996. Probably more than you want to know about the fishes of the Pacific Coast. 2nd Ed. Santa Barbara, CA: Really Big Press, 335 p.

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FY 02 *EXXON VALDEZ* TRUS COUNCIL PROJECT BUDGET

October 1, 200' - September 30, 2002

Budget Category:	Authorized FY 2001	Proposed FY 2002
Personnel		$78.5
Travel		$12.0
Contractual		$23.4
Commodities		$2.0
Equipment		$3.8
Subtotal	$0.0	$119.7
Indirect		
Project Total	$0.0	$119.7
Full-time Equivalents (FTE)		0.6
Other Resources		

LONG RANGE FUNDING REQUIREMENTS

Estimated FY 2003					

Dollar amounts are shown in thousands of dollars.

Comments: Indirect costs included in Personnel costs.

FY02

Project Number: 02678-BAA
Project Title: Bycatch for Science
Name: LGL Alaska Research Associates and collaborators

FORM 4A
Non-Trustee
SUMMARY

Prepared: 12-Apr-01

FY 02 *EXXON VALDEZ* TRU : COUNCIL PROJECT BUDGET

October 1, 200 - September 30, 2002

Personnel Costs:			Months	Monthly		Proposed
	Name	Position Description	Budgeted	Costs	Overtime	FY 2002
	Matt Nemeth	Fishery Biologist	6.0	10.4		62.4
	Bill Wilson	Senior Fishery Biologist - Principle Investigator	0.5	19.0		9.5
	TBD	Fisheries Technician	1.0	6.6		6.6
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	7.5	36.0	0.0	
					Personnel Total	$78.5

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FY 2002
	Anchorage - Kodiak	400.0	10			4,000.0
	Juneau - Kodiak	600.0	2			1,200.0
	Anchorage - Seattle	500.0	2			1,000.0
	Anchorage - Juneau	500.0	2			1,000.0
	Santa Barbara - Kodiak	1000.0	2			2,000.0
	Total per diem category expenses (food/car/lodging)	2800.0	1			2,800.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$12,000.0

FY02

Project Number:
Project Title: Bycatch for Science
Name: LGL Alaska Research Associates and collaborators

FORM 4B
Personnel
& Travel
DETAIL

Prepared: 12-Apr-01

FY 02 *EXXON VALDEZ* TRU : COUNCIL PROJECT BUDGET

October 1, 200 - September 30, 2002

Contractual Costs:	Proposed
Description	FY 2002
Catherine Mecklenburg - 20 d at $320/day	6.4
Milton Love - 1 month at $7,000/day	7.0
Fishing Vessel operators - stipends	6.0
Shipping and communications	2.0
Duplication and printing	2.0
Contractual Total	$23.4

Commodities Costs:	Proposed
Description	FY 2002
Misc consumables (most already taken care of in personnel rates)	2.0
Commodities Total	$2.0

FY02

Prepared: 12-Apr-01

Project Number:
Project Title: Bycatch for Science
Name: LGL Alaska Research Associates and collaborators

FORM 4B
Contractual & Commodities DETAIL

FY 02 *EXXON VALDEZ* TRU: COUNCIL PROJECT BUDGET

October 1, 200 - September 30, 2002

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2002
Survival suits	2	900.0	1,800.0
Deep freezers	2	1000.0	2,000.0
			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**		$3,800.0

Existing Equipment Usage:	Number	
Description	of Units	

FY02

Project Number:
Project Title: Bycatch for Science
Name: LGL Alaska Research Associates and collaborators

FORM 4B
Equipment
DETAIL

Prepared: 12-Apr-01

REMOTE DELIVERY OF PERSISTENT ORGANIC CONTAMINANTS IN ALASKA FISHES: NON-PROBLEM OR HIDDEN PROBLEM

Project Number:	02680
Restoration Category:	General Restoration
Proposer:	Stanley D. Rice, Jeff Short, Adam Moles NMFS, Auke Bay Laboratory ABL Program Manager, Dr. Stan Rice
Lead Trustee Agency:	NOAA
Cooperating Agencies:	Alaska Department of Fish and Game
Alaska Sea Life Center:	no
Duration:	1year
Cost FY 01:	$75,600
Cost FY 02:	$0
Geographic Area:	Copper River, Kenai River Yukon River, Unuk River
Injured Resource/Service:	Salmon/Subsistence

ABSTRACT

There is growing evidence that persistent organic pollutants (POPs) from industrial and agricultural activities are finding their way via atmospheric conveyance into the fish and wildlife of Alaska, raising concern about the health effects for human consumers. This proposal is for a one year project to determine the distribution of persistent organic contaminants in the flesh and ovaries of different year classes of chinook salmon from four major geographical areas of Alaska. A suite of contaminants, including pesticides, Polychlorinated biphenyls (PCBs), chlorinated and unchlorinated hydrocarbons, with known implications for aquatic and human health will be measured in two age classes of salmon. These will be salmon returning after only a year in saltwater and salmon returning after 3-5years. This will give some measure of the extent of atmospheric distribution of industrial and agricultural pollutants over a range of rivers in Alaska. Salmon, with their lipid-rich flesh and importance for sport fishing and subsistence users, are an ideal candidate to assess atmospheric distribution of persistent organic pollutants. This study

will compliment other new studies directed at other species and aid in the assessment of POPs as a significant Alaska regional problem, or not.

A. INTRODUCTION

North Pacific and Alaskan marine waters are generally perceived as largely pristine. Despite some localized pollution from pulp mills, marinas and boat harbors, municipal outfalls, and the occasional industrial effluent, most of Alaska's 6640 miles of coastline are largely devoid of point source pollution. Unlike much of North America, regional pollution (non-point source) is rare. The only major regional pollution event was the Exxon Valdez oil spill, a contaminant threat that has abated considerably over the last 12 years. Regional industrial growth is on the increase in the Cook Inlet area making this region one of longer term concern, but for the moment regional and local pollution are largely the concern of local monitoring efforts. There is an increasing body of evidence that the greatest contaminant threat in Alaska will come, not from local activities, but from clouds and currents carrying contaminants from areas quite distant from Alaska.

The source of this pollution is not in Alaska, but in northern Europe and Asia. This type of pollution is transported to the north Pacific and Alaska by wind and ocean currents. If there is a problem, it is subtle, and relatively hidden. These chemicals are the result of industrial and agricultural activities, often using chemicals like PCB's that haven't been used in the United States for years or pesticides that persistent in the environment for decades. Many of these chemicals are both toxic at very low concentrations and resist biodegradation (the breaking down of complex molecules by detoxifying enzymes). DDT, DDE, PCB, and chlordanes all fit this profile, causing them to persist in the environment for very long time periods. Certain species of fishes make excellent conduits for concentrating and moving these chemicals through the environment due to their ability to accumulate and retain the compounds in their flesh. Lipid - rich fish, such as herring and salmon(and pollock to a lesser extent) may accumulate low concentrations of these persistent organic pollutants from trace quantities in the ocean. These contaminants in prey are transferred to a higher predator when eaten. Marine mammals, which consume these fish also have copious fat reserves coupled with longevity which increases the potential for accumulating toxic concentrations in the flesh. Subsistence users who derive a high percentage of their diet from either fish or marine mammals could also be at risk.

What is the evidence to date for subtle low level contaminants? The evidence is surprisingly good that contaminants are here in Alaska, on a wider scale than most people would realize, but the data are shaky at best that there is a cause/effect relationship. No sampling and analyses have been directed at defining the extent of any remote delivery of these persistent pollutants in the north Pacific or Alaska; studies have been targeted at individual species. Currently, the numbers of studies are growing, and the case can be made for a much larger problem. Most of these studies are relatively isolated, and may not address species of concern, but collectively, they are becoming alarming. For example, sockeye salmon returning to the Copper River had low concentrations of POPs in muscle and eggs; these POPs would have been picked up in the north Pacific when they were maturing (Ewald et al. 1998), and transferred to any predator who ate

them. Aleutian sea otters had 40 times the PCB concentration of otters from Southeast Alaska (Bacon et al. 1999). Eagles from the western Aleutian islands had measurable concentrations of pesticides in eggs; further, reproductive success was diminished in the islands with the highest concentrations in the eggs(Anthony et al. 1999). The source of the PCBs was presumed to be from their dominant fish diet. The review by Norstrom and Muir (1994) list a spectrum of contaminants in several Arctic marine mammals, ranging from ringed seals to beluga whales to polar bears. Measurement of high concentrations of pesticides in killer whales from Canada led to the conclusion that these killer whales were at risk of toxic effects, and that they are now among the most contaminated cetaceans in the world (Ross et al. 2000). A handful of measurements in Steller Sea Lions indicated that levels in some juveniles from Prince William Sound were surprisingly high (Varanasi et al. 1992). Pesticides appear in significant concentrations in several species from previously considered pristine parts of the world. Transport via air currents, in low concentrations, will lead to low levels of contamination in the food web. If these pesticides are bioaccumulated, and come into contact with a fetus or newborn, then poor recruitment can be expected.

Finding a definite answer as to what effect consumption of flesh having low levels of these persistent chemicals will have on fish or predator populations will be difficult if not impossible to obtain. The pattern of mortalities in affected species will not be a catastrophic die off, like in a large oil spill where carcases are collected covered with crude oil. Instead, the population will slowly decline in numbers, for no apparent reason. Poor recruitment of juveniles into the adult breeding population will slowly occur, and the cause will not be obvious. This pattern has occurred for a variety of species in the north Pacific, but linkage with low-level pollution to explain these population declines in unlikely, given how many other factors might be involved.

This study proposes to assess POP levels in flesh and ovaries of salmon returning to 4 major river systems in Alaska- two of which are in the EVOS spill area- Kenai and Copper rivers. Two other systems would also be assessed, Yukon, because it has experience population declines, and the Unuk in Southeast, as a geographic control. Measuring POPs in flesh and ovaries would be a valuable contributor in assessing the significance of hemispheric POP pollution in Alaska marine waters on a scale relevant to many species, and in assessing the regional significance to salmon, predators, and harvesters.

NEED FOR PROJECT

A. Statement of Problem

Organic contaminants are circumpolar, aerially distributed, and have shown up in wild and farmed salmon carcases, including wild salmon from Alaska. These contaminants have an unknown exposure and retention, and unknown consequences on reproductive life stages or consumers. This proposal will acquire king salmon from four major geographical areas in Alaska (Yukon, Kenai, Copper, and Unuk rivers), and measure a suite of contaminants from flesh (important to consumers, including subsistence users), and on ovaries (important to survival

and success of progeny of the stock). These four stocks presumably have different oceanic rearing areas, as they enter the ocean at widely separate areas (the Yukon River enters the Bering sea; the Kenai River enters at Cook Inlet, the Copper River enters the northern gulf of Alaska; The Unuk River enters the Pacific near the Canadian border). King salmon of different marine ages will be measured (age verified by scale analysis) for a suite of persistent organic contaminants from each location to determine if different years at sea have an influence on contaminant load.

B. Rational/Link to Restoration

This project falls under the category of monitoring. We seek to assess the extent to which atmospheric conveyance of persistent organic pollutants may be influenced by the relative location of freshwater rearing and the length of marine residence. If much of the pollution level present in salmon available to sport and subsistence users is derived from atmospheric rather than from local sources of contamination, this will have wide-ranging implications for fisheries management in Alaska. If however, the levels of these compounds are low, restoration efforts can concentrate on issues other than remote contamination.

C. Location

The project will sample chinook salmon from four rivers: the Yukon River, the Kenai River, the Copper River, and the Unuk River on Baranof Island in southeast Alaska. This encompasses nearly the entire range of chinook salmon spawning in Alaska. These fish rear at sea in areas as widely separated as the Bering Sea and the Canadian border with southeast Alaska. These areas have much different temperature regimes and should have much different influences on contaminant loads.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

We anticipate making the results of our study available to sport and subsistence users, particularly in the communities adjacent to the study sites.

PROJECT DESIGN

Samples of ovarian and muscle tissue will be collected from chinook salmon returning to four geographically separated rivers in Alaska to determine variations and absolute concentrations of a suite of pollutants. This will help managers to assess the extent of atmospheric-borne contamination present in salmon in Alaska. Each of the four stocks rear in different areas of the Pacific Ocean and will help determine if different rearing areas or different number of years at sea influence final contaminant load.

A. Objectives

1. Estimate concentration of persistent organic pollutants in the ovary and flesh of chinook salmon from the Yukon, Kenai, Copper, and Unuk Rivers in FY02
    a.. compare concentration differences between tissue types
    b. compare concentration differences between age groups
    c. compare between riverine systems

2. Synthesize the information to determine the significance of the contamination to stocks, and to predators/consumers.

B. Methods

Adult chinook salmon returning to their natal streams will be measured for the concentrations of persistent organic contaminants (PCB's, pesticides, chlorinated and unchlorinated hydrocarbons) in their tissues. There will be 12 samples from each river: three replicate ovary and three replicate muscle tissues from chinook that spent one year in the marine environment and a similar set of replicate tissues from chinook that spent three or more years at sea. Samples will be taken from the Yukon, Kenai, Copper, and Unuk River systems using best laboratory sampling practices. Samples will be sent to laboratories for analysis of the selected spectrum of pollutants. An attempt will be made to ensure that fish sampled are of similar size and show no evidence of obvious pathology. Length, weight, age, and date of sampling will be recorded as well for each replicate fish. Other tissues would be archived for possible future analyses to determine the most sensitive tissue suitable for long term monitoring.

Each analyte will be compared within and across river systems using analysis of variance.

Design alternatives: King salmon were chosen because of their importance to subsistence users, and their range of years in the marine environment. Alternatively, pink salmon with only 1.3 years in the marine environment could be assessed from several geographical locations. There is a trend of POP with age in the literature, and this influenced this proposal to use king salmon where marine age is variable and could be used to assess the significance of the problem. The project could be expected to other species if desired.

Different tissues for assessment was also considered. Flesh is the dominant mass eaten by a predator, and ovaries would be a significant tissue important to the survival of the stock. Liver or some other tissue may be more sensitive. Other tissues will be archived, and may be analyzed if we detect PCBs in a few fish, to determine the best tissue for long term monitoring. At this funding level it is beyond the scope of the project, but the tissues will be archived.

C. Cooperating Agencies, Contracts, and Other Agency Assistance

This project will require the cooperation of the Alaska Department of Fish and Game, Sport Fish Division for collection of returning chinook salmon from weirs on the four rivers.

SCHEDULE

April 15, 2002: will have completed logistics and contracts

July 2002: will have completed all sampling

October 2002: will have completed Chemical and data analysis

January 15, 2003: will have completed annual report to the Trustee Council.

***** Although the reporting drifts into FY03 due to the timing of sample collection and lead time for analytical reporting, no budget requirements are needed in FY03**

A. Measurable Project Tasks for FY02 (October 1, 2001 - September 30, 2002)

April 15, 2002: All contracts and sampling commitments in place

August 1: Complete collection of all samples

B. Project Milestones and Endpoints

May 2002: Collect samples from Copper River, ship for analysis.

June 2002: Collect samples from Yukon River, ship for analysis.

July 2002: Collect samples from Kenai River, ship for analysis

July 2002: Collect samples from Unuk River, ship for analysis

November 2002: Complete analysis of chemical data.

January 15, 2003: Submit final report

C. Completion Date

January 15, 2003

PUBLICATIONS AND REPORTS

A final report will be submitted on 15 January FY03. It is anticipated that one publication will derive from this project.

PROFESSIONAL CONFERENCES

Travel funds are requested for attendance of one individual at the annual Exxon Valdez Restoration Workshop in January 2001.

NORMAL AGENCY MANAGEMENT

The National Marine Fisheries Service (NMFS) does not manage chinook fishery resources in Alaska and has never been required by statute or regulation to monitor contaminant levels in chinook salmon. No project similar to the one proposed here has been conducted in the past by NMFS in Alaska, but similar surveys have been done by NMFS in coastal areas of the continguous United States. Chinook salmon are managed by ADF&G.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

We anticipate no coordination or integration of restoration effort at this time.

PROPOSED PRINCIPAL INVESTIGATORS

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PRINCIPAL INVESTIGATORS

Dr. Stanley Rice will be responsible for design and logistics and assist in report writing.

Jeffrey Short will be responsible for interpreting chemical data and assist in report writing.

Dr. Adam Moles will be responsible for arranging sample collection, contracting with analytical laboratories, data tracking and analysis, and report writing.

BIOGRAPHICAL SKETCHES FOR SCIENTIFIC PRINCIPAL INVESTIGATORS

Dr. Stanley Rice, Ph.D. in Physiology from Kent State University. Dr. Rice is currently Program Manager for the Habitat Division of the National Marine Fisheries Service, Auke Bay Laboratory in Juneau, Alaska. Over the span of a 30 year career, he has authored over 100 peer-reviewed scientific publications, primarily on the effects of oil on Alaska marine organisms. Dr. Rice has managed and conducted Exxon Valdez damage assessment and restoration studies since 1989, including cooperative projects with other agencies, and providing critical reviews and input in agency decisions.

Jeffrey W. Short, MS in Physical Chemistry from University of California, Santa Cruz. Mr. Short is currently a Supervisory Research Chemist for the National Marine Fisheries Service, Auke Bay Laboratory in Juneau, Alaska. He has published 33 papers on the chemistry of petroleum hydrocarbons in Alaskan waters and manages the hydrocarbon analysis facility at the Auke Bay Laboratory. He has served as Principal Investigator on numerous Trustee-funded studies since 1996 and has developed computer-based statistical methods for global examination of sediment and mussel hydrocarbon data for systematic bias, and for identification of probable sources of hydrocarbons.

Dr. Adam Moles, PhD in Fisheries from University of Alaska Fairbanks. Dr. Moles has been a Fisheries Research Biologist with the National Marine Fisheries Service, Auke Bay Laboratory since 1972. His research experience focuses on the effects of pollutants and pathogens on 63 different species of Alaskan marine and freshwater organisms, resulting in over 50 peer-reviewed publications.

LITERATURE CITED

Anthony, R.G., A.K. Miles, J.A. Estes, and F. B. Isaac. 1999. Productivity, diets, and environmental contaminants in nesting bald eagles from the Aleutian archipelago. Environ. Tox. and Chem 18: 2054-2062.

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Norstrom, R.J. and D.C.G. Muir. 1994. Chlorinated hydrocarbon contaminants in arctic marine mammals. Science of the total environ. 154:107-128.

Varanasi U., J.E. Stein, W.L. Reichert, K.L. Tilbury, M.M. Krahn, and S.-L. Chan. 1992. Chlorinated and aromatic hydrocarbons in bottom sediments, fish and marine mammals in US coastal waters: Laboratory and field studies of metabolism and accumulation. In: *Persistent Pollutants in Marine Ecosystems*. (C.H. Walker and D.R. Livingstone, eds.) Pergamon Press, New York, NY. p. 83-115.

FY 02 *EXXON VALDEZ* TRU COUNCIL PROJECT BUDGET

October 1, 200 - September 30, 2002

Budget Category:	Authorized FY 2001	Proposed FY 2002
Personnel		$9.0
Travel		$4.5
Contractual		$53.0
Commodities		$3.0
Equipment		$1.0
Subtotal	$0.0	$70.5
General Administration		$5.1
Project Total	$0.0	$75.6
Full-time Equivalents (FTE)		0.1
Other Resources		

LONG RANGE FUNDING REQUIREMENTS					
Estimated FY 2003	0				
$0.0					

Dollar amounts are shown in thousands of dollars.

Comments:

NOAA Contribution: Jeff Short 1 mo @ 10.6 K, Jeep Rice 2 mos @ 26.2 K, Adam Moles 2 mos @ 18 K for a total NOAA contribution of 54.9 K

FY02

Prepared:

Project Number: 02680
Project Title: REMOTE DELIVERY OF PERSISTENT ORGANIC CONTAMINANTS IN ALASKA FISHES
Agency: National Marine Fisheries Service

FORM 3A
TRUSTEE
AGENCY
SUMMARY

FY 02 *EXXON VALDEZ* TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2001 - September 30, 2002

Personnel Costs:		GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	Proposed FY 2002
Name	Position Description					
Adam Moles	Fisheries Research Biologist	12	1.0	9.0	0.0	9.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		1.0	9.0	0.0	
					Personnel Total	$9.0

Travel Costs:		Ticket Price	Round Trips	Total Days	Daily Per Diem	Proposed FY 2002
Description						
Yukon River				5		1.0
Kenai River				5		1.0
Copper River				5		1.0
Unuk River				5		1.0
Anchorage	(Trustee meeting)			5		0.5
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$4.5

FY02

Prepared:

Project Number:
Project Title: REMOTE DELIVERY OF PERSISTENT ORGANIC CONTAMINANTS IN ALASKA FISHES
Agency: National Marine Fisheries Service

FORM 3B
Personnel
& Travel
DETAIL

FY 02 *EXXON VALDEZ* TRU COUNCIL PROJECT BUDGET

October 1, 200 - September 30, 2002

Contractual Costs:	Proposed FY 2002
Description	
Chemical Analysis	48.0
Contractual labor	5.0
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$53.0

Commodities Costs:	Proposed FY 2002
Description	
sample acquisition and shipping costs	3.0
Commodities Total	$3.0

FY02

Prepared:

Project Number:
Project Title: REMOTE DELIVERY OF PERSISTENT ORGANIC CONTAMINANTS IN ALASKA FISHES
Agency: National Marine Fisheries Service

FORM 3B
Contractual & Commodities DETAIL

New Equipment Purchases:	Number of Units	Unit Price	Proposed FY 2002
Description			
Sampling Equipment			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**		$1.0

Existing Equipment Usage:	Number of Units	Inventory Agency
Description		

FY02

Prepared:

Project Number:
Project Title:
Agency:

FORM 3B
Equipment
DETAIL