Proposal Cover Sheet

February 28, 2011

Proposal Title: Long-term monitoring of Marine Conditions and Injured Resources and Services submitted under the BAA #AB1333F-11-RF-0016

Submitted to:

Elise Hsieh
Exxon Valdez Oil Spill Trustee Council
441 West 5th Ave., Suite 500
Anchorage, AK 99501-2340

Matthew Phelps
NOAA, Office of Acquisition and Grants,
Western Acquisition Division
7600 Sand Point Way NE
Seattle, WA 98115-6349

Submitted by: *Long-Term Monitoring Program Consortium* including:
.Prince William Sound Science Center – P.O. Box 705, Cordova, AK 99574
Contact: Nancy Bird, President nbird@pwssc.org (907) 424-5800 x 225
NOAA Kasitsna Bay Laboratory – 2181 Kachemak Dr., Homer, AK 99603
Contact: Kris Holderied, NOAA Kasitsna Bay Laboratory
kris.holderied@noaa.gov (907) 235-4004
Alaska Ocean Observing System - 1007 West 3rd Ave., Suite 100, Anchorage, AK 99501
Contact: Molly McCammon, Executive Director mccammon@aoos.org (907) 644-6703

Principal Investigators:
Brenda Ballachey, USGS Alaska Science Center, Anchorage
Sonia Batten, Sir Alister Hardy Foundation for Ocean Science, Nanaimo, BC, Canada
Mary Anne Bishop, Prince William Sound Science Center, Cordova
Jim Bodkin, USGS Alaska Science Center, Nordland, Washington
Rob Campbell, Prince William Sound Science Center, Cordova
Heather Coletti, SW Alaska Inventory & Monitoring Network, National Park Service, Anchorage
Thomas Dean, Coastal Resources Associates, Inc., Carlsbad, California
Angela Doroff, Alaska Department of Fish and Game, Homer
Kris Holderied, NOAA Kasitsna Bay Laboratory, Homer
Tuula Hollmen, Alaska SeaLife Center, Seward
Russell Hopcroft and Thomas Weingartner, Institute of Marine Science/UAF, Fairbanks
David Irons, US Fish and Wildlife Service, Anchorage
Brenda Konar and Katrin Iken, School of Fisheries and Ocean Sciences, UAF, Fairbanks
Craig Matkin, North Gulf Coast Oceanic Society, Homer
Molly McCammon, Alaska Ocean Observing System, Anchorage
Jon Moran, National Marine Fisheries Service, Auke Bay Laboratory, Juneau
John Piatt, USGS Alaska Science Center, Nordland, Washington
Stanley (Jeep) Rice, National Marine Fisheries Service, Auke Bay Laboratory, Juneau
Shane StClair, Alaska Ocean Observing System, Anchorage

Proposed dates: October 1, 2011 – September 30, 2016
Budget Request to EVOS Trustee Council: $10,565,910

Nancy Bird

Nancy Bird, President, PWSSC

Kris Holderied

Kris Holderied, NOAA KBL

Molly McCammon

Molly McCammon, Exec. Director, AOOS

TITLE: Long-Term Monitoring of Marine Conditions and Injured Resources and Services

Table of Contents

PROGRAM PLAN: Long-Term Monitoring of Marine Conditions and Injured Resources and Services

I. NEED FOR THE PROGRAM

A. Statement of Problem

In the two decades following the *Exxon Valdez* oil spill (EVOS), and after extensive restoration, research and monitoring efforts, it has been recognized that full recovery from the spill will take decades and requires long-term monitoring of both the injured resources and factors other than residual oil that may continue to inhibit recovery or adversely impact resources that have recovered. Monitoring information is valuable for assessing recovery of injured species, managing those resources and the services they provide, and informing the communities who depend on the resources. In addition, long-term, consistent, scientific data is critical to allow us to detect and understand ecosystem changes and shifts that directly or indirectly (e.g. through food web relationships) influence the species and services injured by the spill.

An integrated monitoring program requires information on environmental drivers and pelagic and benthic components of the marine ecosystem. Additionally, while extensive monitoring data has been collected thus far through EVOS Trustee Council-funded projects as well as from other sources and made publicly available, much of that information needs to be assessed holistically to understand the range of factors affecting individual species and the ecosystem as a whole. Interdisciplinary syntheses of historical and ongoing monitoring data are needed to answer remaining questions about the recovery of injured resources and impacts of ecosystem change.

We propose to develop and implement a long-term monitoring program that meets the need for information to guide restoration activities, including data on the status and condition of resources, whether they are recovering, and what factors may be constraining recovery. **The ultimate goal of the long-term monitoring program is to provide sound scientific data and products to inform management agencies and the public of changes in the environment and the impacts of these changes on injured resources and services.**

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Our proposed long-term monitoring program is: 1) directly relevant to the goals and priorities for “Monitoring and Research” outlined by the EVOS Trustee Council in the 1994 EVOS Restoration Plan; 2) responds to priorities in the FY 2012 Invitation for Proposals; and 3) follows additional Council guidance including the 2010 Injured Resources and Services Update. The 1994 Restoration Plan identifies the continuing need for a sustained and interdisciplinary monitoring system to inform restoration needs and activities for injured resources and services. Specific language in the 1994 Restoration Plan cites the need for monitoring to “understand the physical and biological interactions that affect an injured resource or service, and may be constraining its recovery” (p. 25), recommends an “ecosystem approach” (p. 12), and recognizes that "an ecosystem approach to restoring injured resources and services may require restoration activities that address a resource's prey or predators, or the other biota and physical surroundings on which it depends..."(p. 13). The scientific monitoring program described below is explicitly designed to meet these priorities.

The management strategy we propose to implement for the overall long-term monitoring program is also based on priorities in the 1994 Restoration Plan. First, in that document and in ongoing guidance, the Trustee Council recognizes that there are not sufficient funds to accomplish all necessary restoration and monitoring activities and that partnerships are necessary to meet Council goals. Specifically, the plan states that "Restoration will take advantage of cost-sharing opportunities where effective" (p. 15) and "Priority shall be given to strategies that involve multi-disciplinary, interagency, or collaborative partnerships" (p. 16). As described below (Sections C, D and E and Appendix 1), our proposed monitoring program will expand the efforts previously funded by the Trustee Council through leveraging collaborations with multiple agency monitoring programs and other research programs (such as those of the North Pacific Research Board and the Alaska Ocean Observing System), and with the Herring Program under this funding opportunity.

The 1994 Restoration Plan also included a policy that "Restoration will include a synthesis of findings and results, and will also provide an indication of important remaining issues or gaps in knowledge" (p. 16). We address this priority in our proposed science synthesis component, which includes conceptual ecological modeling, described in Section C. Effective synthesis of science data requires coordinated data management from the beginning of the monitoring program. Data management activities for ecological and physical information have been scattered among different agencies and research groups, reducing the utilization of information for integrated understanding of the ecosystem.

We are also committed to the 1994 Restoration Plan policy that ""Restoration must reflect public ownership of the process by timely release and reasonable access to information and data" (p. 17). We propose to adopt a data management policy for this project that responds to this policy in a transparent and timely fashion.

Community involvement in and public outreach of monitoring results is called for under the 1994 Restoration Plan policy that "Restoration must include meaningful public participation at all levels - planning,project design, implementation and review" (p. 17). We are committed to involving local and native communities and to providing a diverse set of public outreach information and events, as outlined in Section G.

In summary, we propose a long-term monitoring program that will build on past monitoring and research efforts, leverage other initiatives and help ensure that the Trustee Council, agencies and spill-affected communities have the scientifically-based information they need to support the comprehensive, interdisciplinary recovery and rehabilitation program outlined in the 1994 EVOS Restoration Plan and subsequent EVOS Trustee Council guidance documents.

II. PROGRAM DESIGN

A. Background:

The knowledge and experience gained during years of biological and physical studies in the aftermath of the *Exxon Valdez* oil spill have confirmed that restoring and sustaining a healthy marine ecosystem requires an understanding of changes in resources and the diverse ecosystem factors that may influence those changes. Long-term observations are fundamental requirements to detect those changes, understand the causes of change, and inform predictions of future conditions. As recognized in the 1994 EVOS Restoration Plan, effective restoration requires an adaptive management cycle that updates restoration activities as new information and understanding is acquired. The recent tragedy of the Deepwater Horizon oil spill in the Gulf of Mexico further highlights the need for robust long-term observations of marine resources and conditions.

The Gulf of Alaska and its watersheds are part of a larger oceanic ecosystem in which natural physical forces such as currents, upwelling, downwelling, precipitation and runoff, all play important roles in determining basic biological productivity. Mundy et al. (2005) describe the rich Gulf of Alaska biology and the influence of marine conditions. This productive ecosystem was profoundly affected by EVOS, with impacts that continue to the present. Since EVOS, there have been several planning efforts to develop a coordinated long-term monitoring strategy for the oil spill affected area, including the overall guidance in the 1994 Restoration Plan, the detailed ecosystem monitoring plans of the 2002 Gulf Ecosystem Monitoring and Research Program (GEM), and more specific plans such as the nearshore restoration and ecosystem monitoring plans of Schoch et al. (2002) and Dean and Bodkin (2006). In addition, the National Park Service has developed and implemented an ecosystem-monitoring program, under the Vital Signs Long-term Monitoring Plan, for national parks within the EVOS-affected region (Katmai and Kenai Fjords National Parks). All of these plans recognize that monitoring programs in this region face constraints from insufficient funding to meet all needs, the logistics of sampling in remote areas, and the challenge of monitoring a system known to experience broad ecosystem changes on decadal and multi-decadal scales. All the previous monitoring plans include recommendations that, in order to be effective and sustainable, a long-term monitoring program must explicitly account for overall program management, data management, synthesis of existing and new data, outreach of information to managers and the general public, and community involvement.

Long-term monitoring has been implemented within the EVOS-affected region with support from the Trustee Council, agencies, North Pacific Research Board (NPRB), the Alaska Ocean Observing System (AOOS), other research grant opportunities, and citizen science programs. This monitoring has produced long-term datasets for oceanographic conditions, plankton, intertidal invertebrates and algae, fish, marine mammals, and birds. However, the relatively short (2-5 year time frame) of typical research grants and agency budget constraints have made it increasingly difficult to sustain critical time series in the northern Gulf of Alaska region.

More recently, NPRB has started its first (with the intent of more to follow) multi-year Gulf of Alaska Integrated Ecosystem Research Program (GOAIERP), with a stated goal to "bring together different disciplines to answer complex ecological questions in the face of uncertainty and ecosystem change." The first GOAIERP is focusing on identifying and quantifying the major ecosystem processes that regulate recruitment strength of key groundfish species, with the first field season in 2011. In addition, AOOS has implemented a demonstration observing system in Prince William Sound that includes observations and models, and is in the process of expanding some of these components to the Cook Inlet region.

The fundamental need for long-term monitoring stated in the 1994 EVOS Restoration Plan still holds true today. "A lack of long-term research into ecosystem relationships and problems may result in less effective restoration and possibly continued injury. Inadequate information may require managers to unduly restrict human use of the resources, and could compound the injury to services, such as commercial fishing and subsistence. Inadequate information may also lead to management actions that inadvertently reduce the productivity and health of a resource, inappropriate restoration actions, or restoration opportunities missed for lack of knowledge" (p. 25). The proposed monitoring program seeks to effectively fill some of the critical information needs in the EVOS-affected region, with a long-term goal of supporting effective restoration and management of injured resources and services over the next 20 years.

B. Objectives

The long-term monitoring program is organized into Environmental Drivers, Pelagic and Benthic Monitoring components, with linkages between all three components and between the projects within those components. We have also included a separate Lingering Oil component that would be incorporated into the long-term monitoring program, but with additional funding. The design of our proposal for the first five-year period incorporates requirements in the Invitation for Proposals, guidance in previous monitoring plans, perspective from managers of current monitoring programs, and input from scientists at state and federal agencies and universities. Detailed summaries for each of the components and individual project descriptions can be found in Appendix 1 of this proposal.

To meet the long-term restoration monitoring goal, we propose a 5-year long-term monitoring program that:

1) Implements the guidance of Trustee Council planning efforts;

2) Sustains and builds upon existing time series;

3) Enhances collaborations between principal investigator projects in the proposed monitoring program and with the proposed Herring Program;

4) Leverages partnerships with outside agencies and groups to integrate data from a broader monitoring effort than that funded by the Trustee Council;

5) Provides data and scientifically-based data products to a wide variety of users; and

6) Develops science synthesis products to assist management actions, inform the public and guide the evolution of monitoring priorities for the next 20 years.

Throughout this program, we will actively solicit community involvement and produce science-based public outreach products for a wide variety of audiences, as outlined in Section G below. If selected as the preferred proposer by the Trustee Council, we will work directly with local and native communities during the development of the final program, to find the best opportunities for involvement and assess additional needs they have for science outreach products.

Our proposed 5-year monitoring program is intended to form the basis for a 20-year effort, recognizing that adaptive management will be needed to evaluate the effectiveness of the monitoring efforts over time and modify them as needed. The objectives listed above are applicable to the long-term goals of the 20-year program, and the planning for the components, management and products of the proposed monitoring program was conducted with the 20-year effort in mind. However, the remainder of this proposal will focus on the first 5-year period requested in the Invitation for Proposals.

To summarize the specific benefits that we anticipate will be gained from our proposed program, we identified a series of questions that we expect could be answered with the information collected in the next five years and synthesized from historical records. Some of these questions are listed below and additional details can be found in the individual component summaries in Appendix 1 of this proposal.

Cross-cutting (between components and with Herring Program):

1) Are changes in oceanographic conditions in the outer Gulf of Alaska shelf mirrored in the near-shore marine environment and population trends of injured, recovering and recovered resources?

2) Is herring and forage fish overwintering success tied to spring and summer productivity and seasonal or year-to-year differences in the zooplankton community?

3) Is herring and forage fish overwinter success associated with winter conditions on the shelf or in PWS?

4) Are variations in seabird abundance and distribution associated with zooplankton stocks and/or oceanographic conditions?

5) What are predation rates of humpback whale and seabirds on PWS herring and other forage fish populations? (to be applied in herring population modeling efforts)

Environmental Drivers:

6) How do oceanographic patterns compare (and co-vary) between different locations in PWS, Gulf of Alaska shelf, and lower Cook Inlet?

7) What are the spatial patterns and timing of ocean stratification that lead to spring and autumn phytoplankton blooms?

8) How do zooplankton community assemblages and abundances vary spatially, from year to year, with the timing of the spring phytoplankton bloom, and with water properties (temperature, salinity, nutrients)?

Pelagic Monitoring:

9) What are the population trends of key pelagic species groups (killer whales, seabirds, humpback whales, forage fish) in PWS?

10) How can forage fish population trends in PWS be effectively monitored?

Benthic Monitoring:

11) Are there significant inter-annual changes in the near-shore communities and are they synchronous across the Gulf of Alaska?

12) Have injured resources in the near-shore environment recovered from EVOS? If not, can we identify or rule out other, non-spill related, factors that are constraining their recovery?

C. Procedural and Scientific Methods

1. Monitoring Components

Our approach to meet the goals and objectives of the long-term monitoring program includes: 1) sustaining key existing time series; 2) improving connections between and integration of existing monitoring programs; and 3) improving monitoring methods for certain species and ecosystems. Detailed information for the Environmental Drivers, Pelagic and Benthic Monitoring components has been developed by sub-groups of principal investigators and is provided in Appendix 1 of this proposal. The focus of our monitoring program is on injured species, their prey or predator species, and the environmental conditions that may affect those populations.

Based on guidance from EVOS Trustee Council staff, we have also included a Lingering Oil Monitoring component in this long-term monitoring proposal. However, during development of our proposed program, the project team determined that the costs for including lingering oil monitoring would be above the level of funds identified in the Invitation for Proposal for long-term monitoring. The lingering oil component is therefore included as a separate, but related, part of an overall monitoring strategy and is not part of our total budget submission. If we are selected as the preferred proposer, we anticipate working with the Trustee Council on incorporating this effort into the overall program.

The Invitation for Proposals also included suggested projects for weather stations and satellite observation monitoring under the Environmental Drivers section. We considered both of those areas, but decided that 1) they could not be included at the level of funding available, 2) that it would be more cost effective to leverage data from existing National Weather Service, National Park Service and other weather stations, and 3) that satellite data visualizations developed by AOOS as part of data management efforts for this program and other projects would be a cost-effective means of addressing this information need within the existing budget.

The monitoring work outlined here will also inform a separate proposal to the Herring Program portion of the Invitation for Proposals, specifically by providing monitoring information on basic oceanographic conditions, food availability, and predator populations. The Science Team lead (Kris Holderied) plans to work with the proposed Herring Program lead (Scott Pegau) to fully integrate efforts between the two programs, should we be selected as the preferred proposers.

Sustain key existing time series

Long-term datasets in the EVOS-affected area include oceanographic conditions (e.g GAK 1 mooring), plankton (e.g. Continuous Plankton Recorder), intertidal invertebrates and algae (e.g. Kachemak Bay Census of Marine Life surveys), marine mammals (e.g. PWS killer whale and sea otter surveys) and birds (e.g. PWS sea bird and shorebird surveys). Most, if not all, of these monitoring efforts face significant challenges to be sustained into the future, despite the fact that they provide critical information for restoration monitoring. Recognizing that the interactions between changing environmental conditions and injured resources and services must be evaluated over long time periods, it is essential not to lose the long time series that already exist. Our proposed monitoring program will sustain key time series so that we maintain the ability to use those long records to understand the impact of ecosystem change on resources.

Improve connections between and integration of existing monitoring efforts

Long-term monitoring has been implemented within the EVOS-affected region, with support from the Trustee Council, agencies, NPRB, AOOS, other research grant opportunities, and citizen science programs. However, many of these efforts have been conducted independently, with emphasis on monitoring of single species or within individual disciplines. By explicitly incorporating an interdisciplinary framework into the development of our proposal and plans for implementation of the long-term monitoring proposal, we seek to improve linkages between monitoring efforts. The geographic scale of our program (PWS, GOA shelf, lower Cook Inlet) is designed to improve linkages between monitoring in different regions of the spill-affected area, as a way to better discern the impacts of environmental change on restoration and continued recovery of injured resources. As biological productivity in the near-shore regions of the spill-affected area is strongly influenced by physical oceanographic processes and the entire region is linked oceanographically by the Alaska Coastal Current, we will evaluate whether or not changes that may be noted in the near-shore systems are reflected in either oceanographic conditions or with synchronous changes in pelagic species and conditions. Finally, the proposed science synthesis effort described below will integrate information from multiple datasets into a more coherent whole.

As described in detail in the component plans, the monitoring efforts we propose under this program will be closely coordinated with existing monitoring by other agencies. We have already contacted the program managers and scientists in these monitoring programs as part of developing this proposal. Some are participating as principal or collaborating investigators on this proposal and others are interested in sharing data and coordinating on monitoring protocols. We can provide letters of support from all the collaborating agencies if we are selected as the preferred proposer. Some examples include the National Park Service Vital Signs Monitoring Program, the Kachemak Bay Research Reserve System-wide Monitoring Program, USFWS sea otter surveys, and the NPRB GOAIERP. Similarly, while the funds provided in this call for long-term monitoring were not sufficient to include monitoring sites in Kodiak, we have already initiated discussions with the principal investigators of the GOAIERP project and the director of the NMFS Kodiak Laboratory as to how we could collaborate on monitoring efforts.

Finally, most of the individual monitoring projects proposed in this program are leveraging funding from other sources. Those details can be found in the component summaries and the project descriptions. As one example, the proposed costs for the Seward Line oceanographic monitoring project requested in this proposal are only one-quarter of the full costs of that effort.

Develop improved monitoring for certain species and ecosystems

Many of the existing monitoring programs were established with historical or logistical constraints and, in some cases, improvements have already been identified. We are proposing to implement more recently developed monitoring plans for near-shore resources, develop new monitoring methods for forage fish populations and implement an adaptive management strategy for the entire monitoring program.

The Benthic Monitoring component of this proposal will implement portions of near-shore monitoring plans developed with Trustee Council funding (Bodkin and Dean, 2006). These protocols combine intensive sampling of a large suite of biological and physical parameters at a small number of locations (intensive sites) with sampling of a smaller suite of parameters at a larger number of extensive sites. Intensive sampling is esigned to detect larger spatial scale changes while extensive sampling is aimed at evaluating potential impacts from more localized sources, and especially those resulting from human activities.

Forage fish are recognized as a crucially important component of the food web, but there is a lack of long-term data at a population level. As part of the Pelagic Monitoring component, we propose to develop cost-effective sampling protocols for forage fish populations that can be repeated as a monitoring tool in the future. Combined with the set of studies proposed by Pegau et al for the Herring Program, these will provide valuable information on energy flow through the pelagic ecosystem.

Throughout the 5-year monitoring program we will evaluate the effectiveness of the monitoring plan and protocols and recommend changes as needed during the annual workplan submission to the EVOS Trustee Council. As one example of an evaluation that is already planned, in the oceanographic monitoring project in lower Cook Inlet we propose to analyze spatial and seasonal patterns in results from boat-based oceanographic surveys in the first two years to determine if deployment of moored instruments at a few sites could be used as a cost-effective alternative in subsequent years.

Please see Appendix 1 to this proposal for details on the long-term monitoring program components. Curriculum vita for all principal investigators can be found in Appendix 3.

2. Science Synthesis and Conceptual Ecological Modeling

Science Synthesis

In addition to the monitoring efforts, an essential part of our proposed monitoring program will be to synthesize a wide variety of data sets, both from projects included in our proposed monitoring program and from other sources. Science synthesis will combine historical data sets with ongoing data collection to create the time series necessary to answer questions related to the impacts of broad ecosystem changes. It will also integrate information from multiple disciplines to facilitate identification of factors other than oil that may be constraining recovery of injured resources or which may adversely affect their continued recovery. The synthesis effort is also where similar information between different geographic areas will be collected to assess whether changes in marine conditions and species are synchronous between different sites. The data management approach described in Section F below will provide essential support to the synthesis effort, both by making the data more readily available and by developing data visualization products. The key goal for the synthesis effort is to integrate monitoring data across different regions, time scales and disciplines to provide management agencies with better information on potential restoration needs and activities. The science synthesis will also provide the information needed for adaptive management of the monitoring program and inform the year three joint workshop with the Herring Program. Science synthesis will be conducted as a program-wide effort, but will be closely coordinated with individual principal investigators and will be a significant part of the agenda for the annual principal investigator meetings.

In year one, we will focus on identifying and collecting information and reports from previous data synthesis efforts that are relevant to the EVOS-affected area. Simultaneously, the data management effort will focus on supporting development of consistent data management and data protocols for individual projects. As those protocols are developed and coordinated, the synthesis of data time series can begin and will include integrating existing data sets from the spill-affected region (Prince William Sound, outer Kenai coast, Cook Inlet, and potentially Kodiak) into the Alaska Ocean Observing System's data delivery and visualization system. The science synthesis and data management teams will then work together to create data visualizations that combine data species with oceanographic conditions. By working with the AOOS data system we will be able to leverage other sources of funding that will help with the collection of historical data and with improving data visualization and access. A report will be prepared with results of the synthesis to date prior to the joint workshop between the long-term monitoring and herring programs.

Conceptual Ecological Modeling

As an additional tool to support the synthesis of monitoring data and guide the future evolution of the monitoring program we propose to develop conceptual ecosystem models. Conceptual ecosystem models are considered a key element of environmental and biological monitoring programs. Models provide a scientific framework for monitoring programs by describing current understanding of system structure and function, including key system components and their interactions. Models can further be utilized to identify information needs and suitable indicators for further development and design of long-term monitoring plans. Conceptual models also provide a schematic framework to organize and illustrate complex system structure and linkages, thus serving as a tool to facilitate understanding and communication among scientists, managers, and the public.

Development of conceptual ecosystem models to support synthesis and planning of ecological monitoring programs is a multi-phase process. The overall goals of the modeling effort are to describe current state of knowledge about system structure and function, identify linkages between system drivers and responses, support evaluation of data from monitoring studies and selection of appropriate monitoring variables, and facilitate communication among all audiences. The specific goals and scope of the modeling effort will be defined at the start of the process. The development of the conceptual model(s) is a multi-step, iterative process, responding to evolving understanding of the structure and dynamics of the system by revising and refining models throughout the process. Key steps of the model development involve identification of system components, linkages, interactions, and perturbations. Multiple alternative/competing models can be used to facilitate learning by comparing model performances. Multiple approaches will be used to analyze and visualize various components of the models, including structural and influence diagrams, tabulated data, narratives, spatial maps, and mathematical models. The ultimate goals for the development of a conceptual ecosystem model are to support and facilitate selection and prioritization of appropriate indicators and variables for long term monitoring programs, to assist in the development of hypothesis-driven monitoring plans, and to facilitate development of other system models (scenario models, predictive models). It is also anticipated that the synthesis and conceptual modeling efforts we propose in this program will be coordinated with the current NPRB GOAIERP and tangibly support development of the next integrated ecosystem research program.

A working group involving scientists with expertise on the physical and biological components of the system, modelers, and other appropriate parties (including resource managers) will be convened to support the development of the conceptual models. Representatives from the environmental and biological components of the monitoring program will be included, and external collaborators will be involved to assist with specific components of the model. We propose to use some of the annual principal investigator meetings and the year 3 joint long-term monitoring/herring programs workshop as opportunities to convene working groups. Additional meetings may be convened during various stages of the model development. The degree of conceptual modeling that can be supported in the long-term monitoring program will depend on the amount of funding allocated to science synthesis in the overall program. A modest effort is anticipated to be possible under our proposed funding profile.

D. Coordination and Oversight

This proposal is a collaborative effort led by the Alaska Ocean Observing System (AOOS), Prince William Sound Science Center (PWSSC) and NOAA Kasitsna Bay Laboratory (KBL). Ms. Molly McCammon (AOOS) will serve as the overall Team Lead with PWSSC serving as the fiscal agent and providing administrative support for the project. Ms. Kris Holderied (KBL) will serve as the Science Lead and be responsible for overseeing coordination of monitoring projects, science synthesis and integration.

Molly McCammon will serve as the Team Lead for the long-term monitoring program and the primary point of contact for EVOS Trustee Council. She will serve as network coordinator, ensuring coordination of the program with other monitoring initiatives: (e.g., AOOS, GOOS, NPRB GOAIERP, NPS monitoring), with other federal and state programs (e.g. NOAA & USGS Climate programs, Landscape Conservation Cooperatives) and with other North Pacific and west coast initiatives (e.g. NANOOS, CENCOOS, SCCOOS, PACOOS, POST, OTN). She will also lead the outreach and community involvement elements of the program, ensuring that efforts are coordinated, developed and implemented with the outreach team (AOOS, PWSSC, ASLC, KBRR). She will also ensure that monitoring program outreach efforts leverage collaborations with other outreach and education programs (e.g., AK Sea Grant, COSEE Alaska).

Ms. Nancy Bird (PWSSC) will provide overall administrative support for the long-term monitoring program, coordinate project meeting logistics, and be responsible for timely submission of project reports. As the fiscal agent for the program, PWSSC will be responsible for financial administration of the overall contract and all subawards, timely submission of financial reports, and any auditing activities. PWSSC will also monitor program spending.

Shane St Clair will serve as the data management lead on behalf of AOOS. He will be responsible for ensuring that principal investigators are developing appropriate metadata for monitoring time series, providing data archiving services, making data accessible through project websites, and developing data products and visualization tools.

Kris Holderied (KBL) will act as Science Team Leader and be responsible for ensuring a coordinated monitoring program that meets project milestones and deliverables. She will be responsible leading the science synthesis effort and for preparing scientific reports and papers for the EVOS Trustee Council. She will be also be responsible for coordinating the efforts of the long-term monitoring program with the Herring program. She will work with investigators to support outreach efforts.

Kris Holderied is an oceanographer with experience in observational coastal physical oceanography, benthic habitat mapping, satellite-based tools for coastal management, climate change impacts, managing multi-million dollar environmental compliance contracts, and weather forecasting. As Kasitsna Bay Laboratory director since 2005, she has been responsible for science planning, facility operations, and coordination of research and education activities with a wide range of state, federal, local, tribal, non-profit and industry partners. She has prior experience with NOAA, U.S. Army Corps of Engineers, and as an oceanography officer in the U.S. Navy.

To accomplish proper scientific oversight of this long-term monitoring research program, we propose to recruit four members for a scientific oversight panel to help guide the program and ensure that the monitoring program is relevant to the long-term goal. We anticipate that the oversight panel will consist of people representing Alaska Department of Fish and Game, National Oceanic and Atmospheric Administration, academia, and local community perspectives. The oversight panel will be invited to annual principal investigator meetings each year.

In developing this proposal we solicited input from ADF&G, NOAA, USGS, USFWS, NPS, university researchers, and community members, with input on team development and monitoring plans also solicited at the 2011 Alaska Marine Science Symposium. We intend to continue this scientific outreach throughout the 5-year monitoring program.

Program coordination between principal investigators on the research team will be accomplished primarily through e-mail and telephone conversations. Annual investigator meetings are planned, tentatively in November, for all investigators to share information between themselves and potentially with other investigators in the EVOS Trustee Council Herring Program. The meetings will provide an opportunity to update the program science oversight and Council science panels, improve coordination between projects, and provide outreach and public input opportunities. The in-person meetings will also ensure proper communication between the monitoring programs and provide an opportunity to informally review results of field activities and develop initial work plans for the following year.

We recognize the need to coordinate our proposed program with the proposed EVOS Trustee Council Herring program, in order to meet Council goals for the combined long-term monitoring and herring programs. Specific areas of common interest that we have already identified include oceanographic conditions, juvenile herring feeding on zooplankton, herring predation by whales, fish, and birds. All of these factors have the potential to inhibit recovery of herring populations. The forage fish component of our Pelagic Monitoring component must be coordinated with work on herring populations, as well as other forage fish, in the Herring Program. We will also work together with the Herring Program team to identify historic data that both programs would benefit from as part of coordinated data management efforts. Throughout the proposal writing effort we have coordinated with the herring program proposal effort led by Scott Pegau to identify how the two programs can inform and complement each other.

E. Research Team Roles

Our proposed long-term monitoring program is composed of several components (Environmental Drivers, Pelagic and Benthic Monitoring), with series of projects in each component lead by principal investigators from a number of institutions. We provide a brief description of the role of the primary research team. Detailed descriptions of roles the principal investigators for individual projects are provided in Appendix 1. Curriculum vita for the principal investigators are provided in Appendix 3.

Kris Holderied will serve as overall lead for science coordination and synthesis.

Dr. Tuula Hollmen will act as the lead investigator for conceptual ecological modeling efforts.

Dr. Tom Weingartner will be the science lead for the Environmental Drivers Monitoring component.

Dr. Jeep Rice will be the science lead for the Pelagic Monitoring component.

Dr.Brenda Ballachey will be the science lead for the Benthic Monitoring component.

F. Data Management

1. Summary

The proposed data management plan supports the long-term monitoring program with critical data management support to assist study teams in efficiently meeting their objectives and ensuring data produced or consolidated through the effort is organized, documented and available to be utilized by a wide array of technical and non technical users. This effort leverages, coordinates and cost shares with a series of existing data management projects which are parallel in scope to the data management needs of the long-term monitoring program. In the first two years, data management will focus on providing informatics support to streamline the transfer of information between various study teams and isolate and standardize historic data sets in the general spill affected area for use in retrospective analysis, synthesis and model development. These efforts would continue into year three through five and there would be an additional focus on developing management and outreach applications for the data and data products produced from the monitoring program.

Much of the physical and other ecological data that has been collected in the Gulf of Alaska has been inaccessible to the broader scientific community and general public for some time. Data management activities for ecological and physical information occur in isolated, physically distributed agencies leading to low cross-agency utilization of data. There have been serious technical barriers to providing meaningful access to data for user groups, and complex data formats and lack of standardization have made utilizing spatially enabled information a cumbersome and daunting task. The lack of rapid visualization tools has made data exploration difficult; therefore, data has been underutilized in addition to lacking thorough quality control and quality assurance. Tools and technology to manage spatial scientific data have not been developed in a robust fashion, resulting in low access and utilization of the Gulf of Alaska's spatial information resources as they pertain to species distribution, abundance, habitat and physical and chemical metrics.

Emerging data communication protocols and mature open source data management systems provide an effective framework for overcoming these barriers to spatial data management and the development of functional, cost effective management, access and visualization tools. We propose to apply these tools to greatly improve access to and utility of monitoring information for restoration efforts of management agencies and public information.

2. Objectives and Methods

Objective 1. Provide data management oversight and services for long-term monitoring project team data centric activities which include data structure optimization, metadata generation, and transfer of data between project teams.

AOOS data management staff will work with long-term monitoring investigators to document the types of data which will be collected during sampling efforts in addition to document Standard Operating Procedures (SOPs) for data collection to create metadata templates in addition to gauging general data management needs of researchers. This assessment is critical to identify the data management needs and the types of tools needed by researchers to increase their abilities to manage their data in an automated, standard fashion. The assessment will also isolate reporting requirements and specific data transfer needs. Based on the assessment results, investigators will develop a data management plan for each logical data collection effort. This plan will address metadata creation and data delivery for investigators.

Objective 2. Consolidate, standardize and provide access to study area data sets that are critical for retrospective analysis, synthesis and model development.

This task will involve isolating and standardizing historic data sets deemed necessary for retrospective analysis by the long-term monitoring synthesis efforts. Early in the effort the monitoring researcher team will be engaged to prioritize sources of relevant data deemed of high value for the synthesis effort. Data will be prioritized by several metrics including length of time series, scientific importance, and quality and precision of the data storage format. All data acquired through efforts of this project will be merged into the AOOS data system for long term archival and access.

Objective 3. Assist in outreach and education efforts of the long-term monitoring program by producing data visualizations and other information products.

This task will include working with regional agency and outreach staff to develop products and management tools that are based upon data produced or acquired from monitoring project activities. Effective data visualization exposes problems, manifests trends, and allows for high level comparisons with other sources of information. Data visualization products are also ideal tools to communicate information to audiences with varying degrees of familiarity in meaningful and easily understandable ways. Providing these types of high level data products allows members of all user groups to rapidly discover assess and comprehend complex data sets. These tools could include emergency response applications that provide users with rapid detailed access to threatened habitat, species distribution and real time ocean conditions or outreach and education products that provide users visualizations of relevant data at informational kiosks.

Objective 4. Integrate all data, metadata and information products produced from this effort into the AOOS data management system for long term storage and public use.

The ultimate goal of effective data management is to provide services that assist in the organization, documentation and structuring of data collected and made available via the long-term monitoring program activities, so that it can be transferred efficiently to long term data archive and storage centers and made available for future use by researchers and other user groups. This task will leverage the cyber infrastructure and other active data management projects currently being undertaken by AOOS.

G. Outreach and Community Involvement

The outreach/community involvement component of this proposal will be facilitated by the Alaska Ocean Observing System (AOOS), with significant leveraging of the resources of these institutions: the Prince William Sound Science Center (PWSSC) and Oil Spill Recovery Institute (OSRI) based in Cordova, the Alaska SeaLife Center (ASLC) in Seward, the Kachemak Bay Research Reserve (KBRR) in Homer, and COSEE Alaska (Center for Ocean Science Education Excellence). Before we can fully develop a community involvement and public outreach plan, all the components of the long-term monitoring program need to be finalized. If this proposal is successful, we plan to meet first with the existing EVOS TC Public Advisory Group as well as reach out to the communities in the oil spill region to discuss various opportunities for outreach and community involvement. We also plan to coordinate our efforts closely with those for the Herring Project, which are primarily focused in Prince William Sound.

Our partner organizations offer a wide range of capabilities including websites and web materials, teacher workshops, distance learning programs, newspaper and magazine articles, radio and television programs, science camps, and community lectures. They have experienced education and communication staff, and are connected with statewide, regional, national and international education and outreach programs.

We propose to develop outreach materials specifically targeted to both the larger hub communities as well as Alaska Native villages in the oil spill region, in essence bringing science to the communities. We propose to host mini-science symposiums in spill area communities, and contribute to the proposed Wisdomkeeper conference sponsored by spill area communities. In this five-year proposal, we propose to begin discussions with spill-area communities (primarily Prince William Sound and lower Cook Inlet) concerning development of a potential community-based citizen science monitoring program. We propose to hold a conference on this issue in Year two of this proposal, and seek additional funding sources (primarily through private sources) to implement such a program that would incorporate local and traditional Alaska Native knowledge into ongoing monitoring efforts.

H. Description of Study Area

As described Section C and the project summaries in Appendix 1 below, the proposed study area includes all of Prince William Sound, parts of the outer Kenai Peninsula coast and lower Cook Inlet/Kachemak Bay – all within the EVOS-affected area. While the majority of the monitoring efforts will be focused in PWS, monitoring in other locations within the spill-affected areas will significantly improve the ability to answer questions about ecosystem change impacts on injured resources and services.

Within PWS, oceanographic monitoring will include the central Sound, the Hinchinbrook and Montague Entrances and the four bays (Zaikof, Whale, Eaglek, and Simpson) that were extensively studied during the Sound Ecosystem Assessment (SEA) study and PWS Herring Survey program. These bays are also proposed to be a focus for the Herring Program proposal led by Scott Pegau to this funding opportunity. Monitoring in these bays will leverage the availability of historical data and research studies for those locations and provide detailed site information. Benthic monitoring sites in PWS are located on the eastern, northern and western coasts (Figure 1) and pelagic monitoring will take place throughout Sound waters. See the detailed component plans in Appendix 1 of this proposal for additional study area figures.

Along the Gulf of Alaska shelf, oceanographic measurements will focus on tracking variability and trends in the Alaska Coastal Current, with the intent of linking those patterns to nearshore oceanographic and biological processes in PWS and lower Cook Inlet. Nearshore monitoring and sea otter surveys will also take place along the coast of Kenai Fjords National Park, in collaboration with NPS. In lower Cook Inlet and Kachemak Bay, oceanographic and nearshore monitoring, as well as sea otter surveys will be conducted, leveraging existing agency and citizen science monitoring efforts to cost-effectively collect similar datasets to those in PWS. Figure 2 illustrates the overlap and potential linkages between our proposed program and intensive field sampling in the NPRB GOAIERP project scheduled for 2011 and 2013.

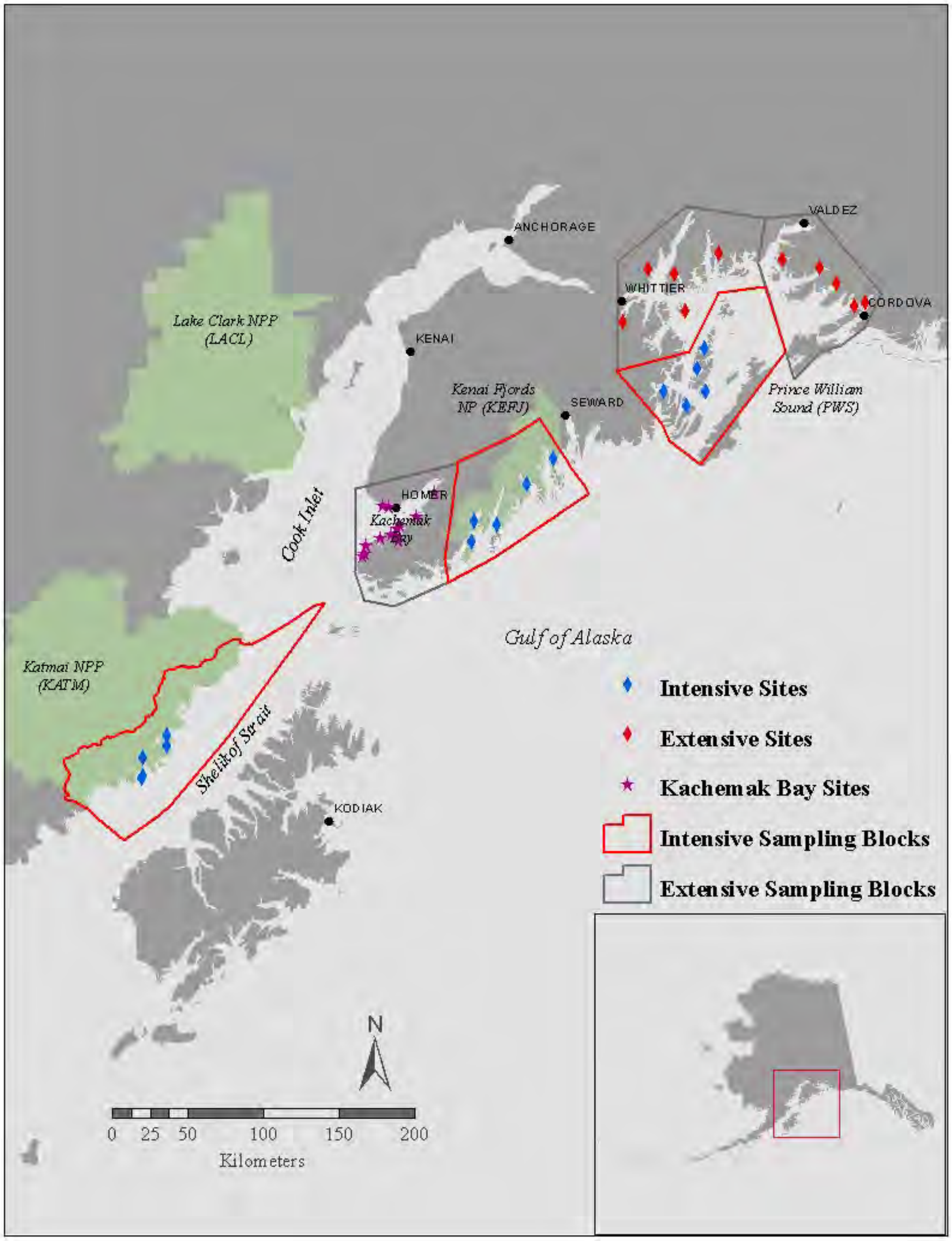


Figure 1. Study area for proposed Long-term Monitoring program includes sites in PWS, outer Kenai coast and lower Cook Inlet/Kachemak Bay. Figure shows sites for the Benthic Monitoring component of the program. Near-shore sites will be monitored in PWS (red and blue) and Kachemak Bay (purple) under this proposal, in conjunction with sites monitored by the National Park Service in Kenai Fjords and Katmai National Parks.

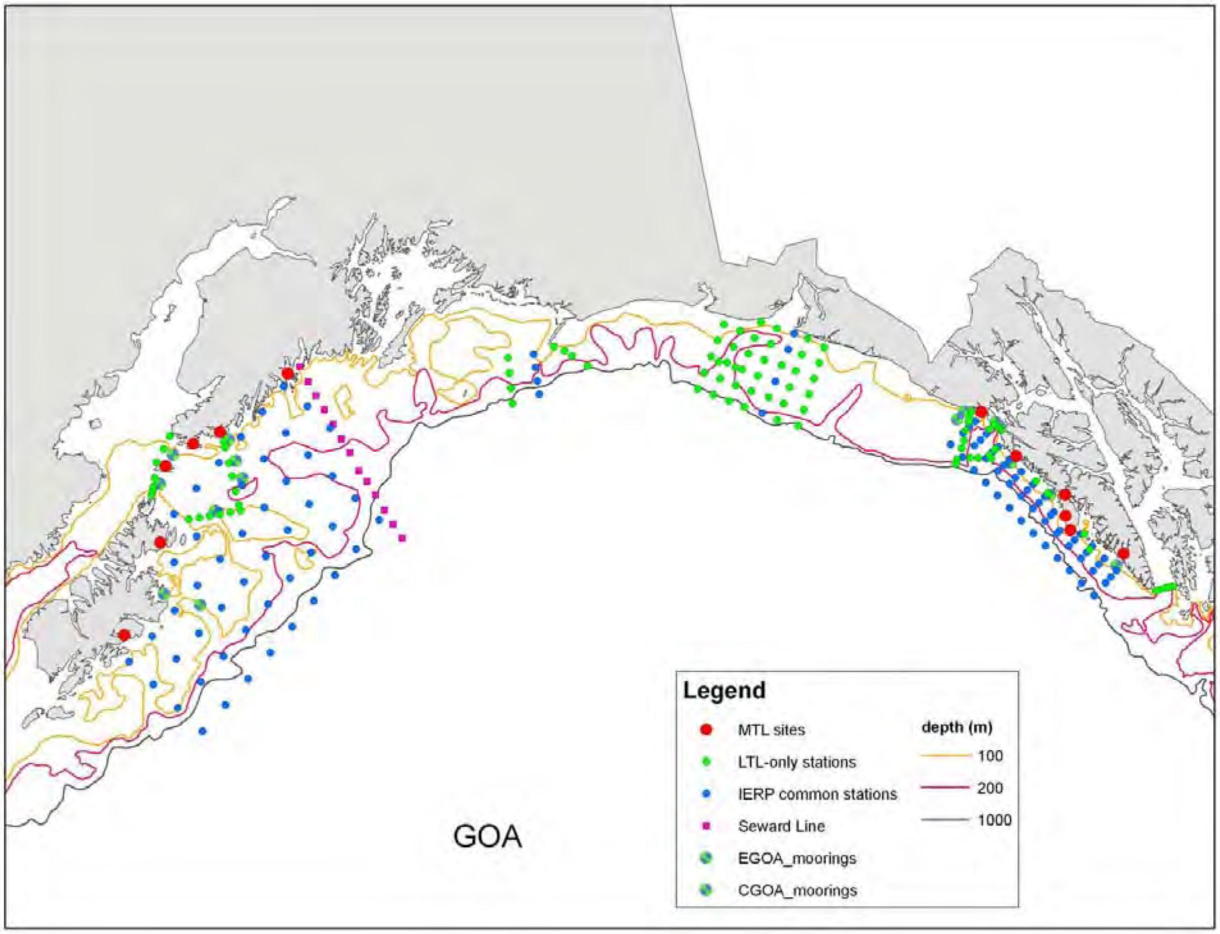


Figure 2. 2011 and 2013 field sampling plan for the NPRB Gulf of Alaska Integrated Ecosystem Research Program (GOAIERP). LTL indicates lower trophic level (including oceanography and plankton) and MTL indicates middle trophic level (including forage fish). The Seward Line sites (purple dots) are also proposed to be sampled in our proposed long-term monitoring program.

III. SCHEDULE

A. Measurable Project Tasks

The following provides a schedule for administrative meetings and a sampling of the project monitoring activities proposed over the five-year period. Additional information on project schedules can be found in Appendix 1.

FY12 1^{st} Quarter (October 1, 2011 to December 31, 2011)

October	Potential participation in Wisdomkeeper conference
November	Conduct annual PI meeting
December	Conduct PWS humpback whale and seabird survey

FY12 2^{nd} Quarter

January	Annual Marine Science Symposium
February	Conduct PWS humpback whale and seabird survey
April	Initiate summer Continuous Plankton Recorder (CPR) surveys
April	PWS Sea otter survey

FY12 3^{rd} Quarter

May	Conduct annual PI meeting
May	Seward Line cruise
June	Submit FY13 work plan for review
June	Kachemak Bay intertidal survey/ PWS nearshore monitoring cruise

FY12 4^{th} Quarter

August	Submit annual report
September	Conclude summer CPR surveys/ Seward Line cruise

FY13 1^{st} Quarter (October 1, 2012 to December 31, 2012)

October	Conduct PWS humpback whale and seabird survey
November	Conduct annual PI meeting & conceptual ecological modeling workshop.
December	Conduct PWS humpback whale and seabird survey

FY13 2^{nd} Quarter

January	Annual Marine Science Symposium
February	Conduct PWS humpback whale and seabird survey

FY13 3^{rd} Quarter

April	Initiate summer CPR surveys/ PWS Sea otter survey
May	Seward Line cruise
June	Submit FY14 work plan for review.

June Kachemak Bay intertidal survey/ PWS nearshore monitoring cruise

FY13 4th Quarter
August Submit annual report
September Conclude summer CPR surveys/ Seward Line cruise

FY14 1st Quarter (October 1, 2013 to December 31, 2013)
October Submit synthesis to EVOS science council
October Conduct PWS humpback whale and seabird survey
November Conduct annual PI meeting
December Conduct PWS humpback whale and seabird survey

FY14 2nd Quarter
January Annual Marine Science Symposium
February Conduct PWS humpback whale and seabird survey
Winter Joint EVOS sponsored workshop with Herring and Long-term Monitoring programs

FY14 3rd Quarter
April Initiate summer CPR surveys/ PWS Sea otter survey
May Seward Line cruise
June Submit FY15 work plan for review
June Kachemak Bay intertidal survey/ PWS nearshore monitoring cruise

FY14 4th Quarter
August Submit annual report
September Conclude summer CPR surveys/ Seward Line cruise

FY15 1st Quarter (October 1, 2014 to December 31, 2014)
October Conduct PWS humpback whale and seabird survey
November Conduct annual PI meeting
December Conduct PWS humpback whale and seabird survey

FY15 2nd Quarter
January Annual Marine Science Symposium
February Conduct PWS humpback whale and seabird survey

FY15 3rd Quarter
April Initiate summer CPR surveys/ PWS Sea otter survey
May Seward Line cruise

May	Submit five-year plan for FY17-22 and work plan for FY16
June	Kachemak Bay intertidal survey/ PWS nearshore monitoring cruise

FY15 4th Quarter

August	Submit annual report
September	Conclude summer CPR surveys/ Seward Line cruise

FY16 1st Quarter (October 1, 2015 to December 31, 2015)

November	Conduct annual PI meeting

FY16 2nd Quarter

January	Annual Marine Science Symposium

FY16 3rd Quarter

April	Initiate summer CPR surveys/ PWS Sea otter survey
May	Seward Line cruise
June	Submit work plan for FY17
June	Kachemak Bay intertidal survey/ PWS nearshore monitoring cruise

FY16 4th Quarter

August	Submit annual report
September	Conclude summer CPR surveys/ Seward Line cruise

IV. BUDGET

Provided in Table 1 below is a general program budget for the five year period from FY12 to FY16, with the numbers in thousands of dollars. We recognize that there may be changes to the program and budget based on review by the Trustee Council's science advisory panel, but the budget we have proposed reflects our confidence – and that of our principal investigators - that the proposed work will fit within the funds available. The budget provides total funding amounts by year for each monitoring project expected to be a part of the program, science synthesis, data management, public outreach and program administration. *This budget assumes that funding to Trustee agencies will be provided directly to that agency and not through the PWSSC*. Routing funds for Trustee agencies through the PWSSC will cause significant increases in overhead costs and may incur difficulties in transferring funding from a non-profit organization to a state or federal agency. All non-Trustee organizations involved in this proposal are included as subcontracts to the PWSSC.

The total amount of funding requested over five years is the $10.566 million amount established for the long-term monitoring program in the Invitation for Proposals. The budget was developed based on detailed annual project needs identified by principle investigators and does not simply increase at a 2.75% rate of inflation each year. The requested funding profile is necessary to most efficiently achieve the scientific objectives of the monitoring program and maximize the ability to share resources with other programs.

Costs for program management were developed based on input from regional science and monitoring program managers, including those from the Trustee Council-funded Herring Survey program, the National Park Service Southwest Alaska Network (SWAN), and AOOS. The budget allocations for program management-related efforts (administration, science coordination and synthesis, data management and outreach) will also depend on the decisions made by the Council regarding the components of and products derived from the monitoring program. The proposed long-term monitoring program program was developed in close collaboration with the herring program proposal led by Scott Pegau, in order to reduce overall costs and respond to the Council's stated intent for coordination between these programs in the Invitation for Proposals. Costs for administration and data management provided in this budget are reduced from what they would be without this collaboration. If these proposals are not funded jointly, the administration costs in each individual proposal would be significantly higher.

As discussed above, we have also included project ideas for a Lingering Oil Monitoring component in the project descriptions of this proposal (Appendix 1). Since costs for including these projects would be above the level of funds identified in the Invitation for Proposal for long-term monitoring and also fall within another focus area of the Invitation, this component is included as a separate part of an overall monitoring strategy and is not part of our total budget submission. If we are selected as the preferred proposer, we anticipate working with the Trustee Council on options to incorporate these effort into the overall program.

Table 1. Budget by project and year.

Long-Term Monitoring Proposal Budget - 2011-2016

Activity (Costs in $K)	Yr1	Yr2	Yr3	Yr4	Yr5	5 Yr TOTAL
Environmental Drivers						
Prince William Sound Oceanographic	218.40	177.21	181.80	186.58	191.55	955.54
GAK1 (Gulf of Alaska)	100.00	103.00	106.00	109.00	112.00	530.00
Seward Line	90.00	54.94	92.22	95.43	98.80	431.39
Lower Cook Inlet Oceanographic	150.00	150.00	150.00	132.00	132.00	714.00
Continuous plankton recorder (CPR)	0.00	61.29	63.13	65.02	66.97	256.40
Environmental Drivers Total	***558.40***	***546.44***	***593.14***	***588.03***	***601.32***	**2,887.33**
Pelagic Monitoring						
Killer whale monitoring		122.00	122.00	122.00	122.00	488.00
Humpback whale monitoring	122.00	122.00	122.00	122.00	55.00	543.00
Forage fish	193.00	186.00	186.00	186.00	137.30	888.30
Seabird monitoring	150.00		300.00		150.00	600.00
Bird synthesis	30.00					30.00
Seabird monitoring	47.40	72.10	74.26	76.46	79.14	349.35
Pelatic Monitoring Total	***542.40***	***502.10***	***804.26***	***506.46***	***543.44***	**2,898.65**
Benthic Monitoring						
Nearshore benthic PWS (sea otters, seagrass/kelp, intertidal invertebrates/algae, benthic voraging seabirds)	282.45	304.11	331.91	309.56	331.91	1,559.93
Kachemak Bay Intertidal	44.00	44.00	44.00	44.00	44.00	220.00
Benthic Monitoring Total	***326.45***	***348.11***	***375.91***	***353.56***	***375.91***	**1,779.93**
Coordination, Data Management, Outreach and Administration						
Administration and meeting logistics	200.00	200.00	200.00	200.00	200.00	1,000.00
Data Management	150.00	150.00	150.00	150.00	150.00	750.00
Science Synthesis/Coordination	200.00	200.00	200.00	200.00	200.00	1,000.00
Outreach	50.00	50.00	50.00	50.00	50.00	250.00
Coord., Data Mgt, Outreach & Admin.	***600.00***	***600.00***	***600.00***	***600.00***	***600.00***	**3,000.00**
Overall Program Total Cost	**2,027.25**	**1,996.65**	**2,373.31**	**2,048.05**	**2,120.66**	**10,565.91**

Lingering oil Monitoring						
1 - Extending Tracking oil composition and weathering in PWS	18	12	155.2	8	6	199.2
2a - Evaluate Chronic Exposure of Harlequin Ducks in PWS	101.85					101.85
2b - Evaluating Chronic Exposure of Sea Otters in PWS	85.5					85.5
Total Lingering Oil Monitoring	**205.35**	**12**	**155.2**	**8**	**6**	**386.55**

Tab 1 - Information on the Consortium or Organization

The consortium submitting this proposal consists of three primary organizations that collectively, bring a wealth of knowledge about the spill-affected region, experience with managing multi-million dollar science programs with multiple partners, and capacity to leverage significant additional resources. These organizations are the Prince William Sound Science Center (PWSSC), which will act as the administrative lead and fiscal agent for the project; the NOAA Kasitsna Bay Laboratory (KBL), which will serve as the science lead; and the Alaska Ocean Observing System (AOOS), which will provide data management and outreach services, as well as overall networking and coordination support. AOOS will serve as the primary Point of Contact.

a. Years in existence

   i. The Prince William Sound Science Center was established in 1989 following the Exxon Valdez oil spill. It is an incorporated non-profit organization based in Cordova, Alaska with a 13-member governing board.

   ii. The NOAA Kasitsna Bay Laboratory was established as a federal marine science field facility near Seldovia, Alaska in 1959 and completed a major facility renovation in 2007. It is a NOAA facility under the National Ocean Service, National Centers for Coastal Ocean Science (NCCOS) - part of the Center for Coastal Fisheries and Habitat Research (CCFHR). KBL is jointly operated by NOAA and the University of Alaska Fairbanks (UAF) School of Fisheries and Ocean Sciences. KBL also has an administrative office in Homer, Alaska.

   iii. The Alaska Ocean Observing System was established in 2003 as the Alaska regional component of the national Integrated Ocean Observing System, and is run by a board consisting of federal, state, and research entities involved in ocean observing in Alaska who are signatories to a Memorandum of Agreement.

b. Current and future sources of funding

   i. PWSSC's current budget includes research grant awards from the PWS Oil Spill Recovery Institute, the Alaska Ocean Observing System, NASA, USGS, Paul Allen Foundation, North Pacific Research Board, National Fish and Wildlife Foundation, Exxon Valdez Oil Spill Trustee Council, Pacific Ocean Shelf Tracking System, Copper River Watershed Project, Alaska Department of Fish & Game, Pacific Joint Venture, and US Fish and Wildlife Service. Additional grant support is awarded to our education and general programs by ConocoPhillips, BP, North Pacific Research Board, National Parks Foundation, EPA, US Forest Service, PWS Regional Citizens' Advisory Council, Alaska Geographic, Co-Bank, Chugach Alaska Corporation, the Meacham Foundation, Alaska Airlines, ERA Aviation, Odom Corporation, American Seafoods, Wells Fargo and various local Cordova businesses.

   ii. KBL receives funding from both NOAA and UAF's SFOS.

   iii. AOOS receives funding primarily from NOAA, with some additional funding from the National Science Foundation and the US Army Corps of Engineers.

c. Current staff size by area of expertise

   i. PWSSC Total staff: 25. Research expertise (M.S. or Ph.D.): 11. Research technicians: 2. Education specialists: 5. Administrative support: 7.

   ii. KBL: 2 full-time NOAA federal staff (director and facility manager); 2 full-time UAF facility support staff; part-time administrative support from

NOAA/CCFHR (Beaufort, NC) and UAF School of Fisheries and Ocean Sciences (Fairbanks, AK).

iii. AOOS: 2 full time program staff (executive director and program manager); 4 full time data management staff; 1.5 fte administrative support at Alaska SeaLife Center; .5 science support contractor; and numerous project contractors.

d. Audited financial statements covering the past three years –

i. Attached are audited statements for the PWSSC for FY08, FY09 and FY10. The PWSSC operates on the federal fiscal year and its audits are conducted by Mikunda, Cottrell & Co., Inc. (Anchorage, Alaska).

ii. KBL: no audits required.

iii. AOOS: audits are conducted annually by KPMG and are available upon request.

e. Facility information, ownership, size and resources available

i. PWSSC has a 3,000 square foot 2-story office and lab facility leased for $1/year from the City of Cordova. A new building on property adjacent to the current building is in the planning stages and will consist of a new, energy-efficient 8,000 square-foot building that will include offices, lab, equipment workshop and storage and a conference room. A capital campaign for that new facility is led by the PWSSC Board of Directors and will likely be completed in phases over the next 5 years.

ii. KBL is part of the Center for Coastal Fisheries and Habitat Research (CCFHR) under the NOAA National Ocean Service (NOS) National Centers for Coastal Ocean Science (NCCOS). KBL is operated under a Joint Project Agreement between NCCOS and the University of Alaska Fairbanks (UAF). The KBL campus is located 9 miles from Seldovia, Alaska and includes 9 main buildings (2 laboratories, scuba building, 2 dormitories, 2 maintenance buildings, and staff housing). KBL also leases an administrative office in Homer, AK. Science facilities include wet and dry laboratories, a flowing seawater system, and dive support facilities. KBL hosts visiting researchers and education groups and can house up to 48 overnight visitors. Administrative support for KBL is provided through NOAA/CCFHR offices in Beaufort, NC and by UAF/SFOS offices in Fairbanks, AK.

iii. AOOS has its main offices in downtown Anchorage, including a conference room and associated facilities to accommodate 30-40 participants. AOOS also has access to facilities at the Alaska Sealife Center in Seward, as well as at the facilities of its federal, state and university board members.

f. Statement confirming proposal and related activities are consistent with the organization's founding and mission

i. This proposal is consistent with the PWSSC mission to promote the goal of maintaining long-term, self-regulating biodiversity, productivity and sustainable use of renewable resources of Prince William Sound, the Copper River and the Gulf of Alaska; contribute to the comprehensive description, sustained monitoring, and ecological understanding of Prince William Sound, the Copper River and the Gulf of Alaska; and to educate and inform the youth and general public about the critical inter-dependence of ecosystem science and the regional economies of Alaska.

ii. This proposal is consistent with the KBL mission to: support Alaska coastal managers and communities with science to understand how subarctic coastal ecosystems respond to changing environmental conditions. It is also consistent with the CCFHR missions to: 1) understand and forecast ecological effects of habitat and environmental change on coastal ecosystems and resources; and 2) provide managers and the public with the knowledge and guidance to preserve, protect and restore coastal resources.

iii. ii. This proposal is consistent with the AOOS mission to address regional and national needs for ocean information, gather specific data on key coastal and ocean variables, and ensure timely and sustained dissemination and availability of these data. AOOS represents a network of critical ocean and coastal observations, data and information products that aid our understanding of the status of Alaska's marine ecosystem and allow stakeholders to make better decisions about their use of the marine environment.

g. <u>Number of members of existing science or technical review panel</u>

i. PWSSC - The Research Committee for the PWSSC serves as its review panel and currently includes seven members: Dr. Jeffrey Welker (UAA) is the Committee Chair and other members include Caryn Rea (ConocoPhillips), Dr. Clarence Pautzke (retired), Dr. John Goering (UAF Emeritus), Dr. Eric Knudsen (Consultant), Michael Mahoney (PWS gillnet fisherman), and Dr. W. Scott Pegau (OSRI Research Program Manager).

ii. KBL has a Science Board that provides input for research planning and current members include: Dr. Mike Castellini (UAF), Dr. David Christie (UAF), Dr. Douglas Demaster (NMFS), Dr. Ken Goldman (ADF&G), Dr. David Johnson (CCFHR), Dr. Brenda Konar (UAF), Mr. Jon Kurland (NMFS), Mr. Michael Opheim (Seldovia Village Tribe), Mr. Charles Swanton (ADF&G), and Mr. Terry Thompson (ADF&G/Kachemak Bay Research Reserve).

iii. AOOS convenes scientific and technical panels as needed for science advice. Three statewide user panels, representing scientific, technical and stakeholder expertise, provide advice on marine operations, coastal hazards, and ecosystems and climate change.

To accomplish proper scientific oversight of this long-term monitoring research program, Science Team Leader Kris Holderied will recruit four members for a scientific oversight panel to help guide the program and ensure that the monitoring program is relevant to the long-term goal. We anticipate that the oversight panel will consist of people representing Alaska Department of Fish and Game, the National Oceanic and Atmospheric Administration, academia, and local community perspective. There will be annual Principal Investigator meetings each year to provide updates to this oversight panel, improve coordination between projects, and provide outreach and public input opportunities. This meeting will also serve as an opportunity to review results from summer field seasons and provide input on the development of the following year’s work plan. In developing this proposal we solicited input from ADF&G, NOAA, USGS, NPS, university researchers, and community members. Team development and input on research direction was also sought at the 2011 Alaska Marine Science Symposium. We intend to continue this scientific outreach throughout the 5-year program.

h. Number of members of existing public advisory committee or mechanism for public involvement

None of the members of the consortium has a formal public advisory committee that would be appropriate for this project. If this proposal is successful, we plan to meet first with the existing EVOS TC Public Advisory Group to discuss various opportunities for outreach and community involvement. We also plan to coordinate our efforts closely with those for the Herring Project, which are primarily focused in Prince William Sound.

The outreach/community involvement component of this proposal will be facilitated by the Alaska Ocean Observing System (AOOS), with significant leveraging of the resources of these institutions: the Prince William Sound Science Center (PWSSC) and Oil Spill Recovery Institute (OSRI) based in Cordova, the Alaska SeaLife Center (ASLC) in Seward, and the Kachemak Bay Research Reserve (KBRR) in Homer. In addition, we will take advantage of the resources connecting scientists and educators provided through COSEE Alaska (Center for Ocean Science Education Excellence), a partnership between AOOS, the ASLC, Alaska Sea Grant Program, and the University of Alaska.

i. PWSSC solicits public involvement through an email list serve (350 + names) which is maintained by the education staff and used at least weekly for notices and information sharing. The center also publishes a newsletter three times annually and solicits public comments and involvement through two blog sites, one for research programs and the other for education programs.
ii. KBRR: For Cook Inlet/Kachemak Bay, the Kachemak Bay Research Reserve and the Kasitsna Bay Lab have contacts with local newspapers and radio stations and access to science education events for general public that can be used to solicit public input.
iii. AOOS has an extensive website, an email list serve (500+ names), a newsletter, three user committees which include public members, and is co-host of a bi-monthly Alaska Marine Policy Forum that is used to share information about marine research and policy activities.

i. Name and resume of the Team Leader and any key staff

The overall Team Leader and Point of Contact is Molly McCammon at AOOS. Other key staff are:
i. PWSSC: Nancy Bird is the Administrative Lead.
ii. KBL: Kris Holderied is the Scientific Team Lead.
iii. AOOS: Molly McCammon also is the outreach and networking lead. Shane StClair is the data management Lead.

j. Capabilities of existing IT infrastructure to make data and reports publicly available

All three members of the consortium have IT infrastructure capable of making data and reports publicly available. For this program, AOOS has committed to leverage its data management resources to assist the research teams in efficiently meeting their objectives and ensuring data produced or consolidated through the effort is organized, documented and available for use by a wide array of technical and non-technical users. This effort will leverage, coordinate and cost share with a series of existing data management projects. We will work with LTM investigators to develop and implement protocols for making the data available in a timely fashion.

Earlier funding support from EVOS TC resulted in a web-based portal for the PWS herring data. This portal and other important historic herring data sets are currently being incorporated into the AOOS data visualization and management framework. There is also a current website for the PWS herring survey program at http://www.pwssc.org/herringsurvey/index.shtml where basic information about each project within that program can be found with links to the annual reports on the EVOSTC website. A similar website will be developed for the Long-Term Monitoring program, and the AOOS data system will be used to host and support the LTM Program data portal. The AOOS IT structure is well developed to current national standards. AOOS data management staff will work with the LTM investigators to document Standard Operating Procedures for data collection and to assess their needs and tools that will increase their ability to manage data in an automated, standard fashion.

Tab 2 - Experience with EVOSTC Program

a. Amount of funding received from EVOSTC programs currently or in the past and listing of projects funded

i. PWSSC:

EVOS History of Funding to PWSSC

Based on annual audits - Fiscal years 1994-1998 were state fiscal years; 1999 to present is federal fiscal year.

Fiscal Year	Brief Project Title	Amount	Agency Pass Through
1994	Sound Ecosystem Assessment (SEA) - program planning	59,050	ADF&G, UAF
1995	95 SEA program projects	2,382,544	ADF&G, UAF
1996	96 SEA program projects	2,149,174	NOAA, USFS
1997	97 SEA program projects	1,738,277	NOAA, USFS
1998	98 SEA program projects	2,004,856	NOAA, USFS
1999	Close-out SEA program projects + 2 new projects: (1) Food web muscle study and (2) Target Strength	617,086	NOAA
2000	(1) Food web muscle study; (2) Target Strength; (3) Hinchinbrook Mooring; (4) Salmon paper	267,866	NOAA
2001	(1) Hinchinbrook Mooring; (2) Prey/Predator of Fry; (3) Target Strength; (4) Food web muscle study; (5) Salmon paper	232,525	NOAA
2002	(1) Hinchinbrook Mooring; (2) Prey/Predator of Fry; (3) Food web muscle study; (4) Salmon paper	137,520	NOAA
2003	(1) Hinchinbrook Mooring; (2) Food web; (3) Salmon paper; (4) GEM Community Involvement; (5) Trophic Dynamics	132,786	NOAA
2004	(1) GEM Nutrient investigation of Copper River Delta; (2) Food web; (3) Seafood waste; (4) Trophic dynamics	186,979	NOAA, USGS
2005	(1) GEM Nutrient investigation of Copper River Delta; (2) Seafood waste; (4) Trophic dynamics	1,102,039	NOAA, USGS
2006	(1) GEM Nutrient investigation of Copper River Delta; (2) Seafood waste	349,533	NOAA, USGS
2007	(1) GEM Nutrient investigation of Copper River Delta; (2) Seafood waste; (3) Trophic dynamics; (4) PWS Herring studies	519,534	NOAA, USFWS, USGS
2008	PWS Herring studies	499,612	NOAA, USFWS
2009	PWS Herring studies	700,810	NOAA, USFWS
2010	PWS Herring studies	1,078,668	NOAA, USFWS
	Total	**$14,158,859**	

ii. KBL: No funding has been received from the EVOSTC Program by KBL or CCFHR scientists.

iii. AOOS: No funding has been received from the EVOSTC Program, although the current AOOS Executive Director is a former ED of the EVOSTC and is very familiar with the program.

b. Statement regarding understanding of EVOSTC policies and procedures, and any conflicts between the organization's policies/procedures and those of the EVOSTC. Policies and procedures of the EVOSTC are determined unanimously by the six Trustees and must conform to the terms of the legal settlement documents.

i. The PWSSC has a long history of working with and contracting for the EVOSTC. In the mid-1990's, our contracts were pass-through contracts from the Alaska Department of Fish & Game but for the past decade or more, we have contracted through NOAA for EVOSTC funds. We have an excellent record with our NOAA contract officers. There are no known conflicts between our policies/procedures and those of the EVOSTC.
ii. KBL: There are no known conflicts between KBL policies/procedures and those of the EVOSTC.
iii. AOOS: There are no known conflicts between AOOS policies/procedures and those of the EVOSTC.

Tab 3 - Current Focus Areas and Funding Sources

a. Listing of current focus areas and amount of funds released for each area

i. PWSSC: Current research focus areas and funding include the PWS Herring Survey research program - $1,281,437 *(EVOS TC);* PWS Observational Oceanography - $103,890 *(OSRI);* PWS Ocean Observing System - $329,408 *(AOOS);* Melting ice, habitat change & nutrient flux - $427,962 *(NASA);* Copper River plume – climate change - $168,435 (*USGS);* Post-breeding Marbled murrelets - $36,516 *(NPRB);* Headwaters to Ocean – development of web-based information service - $37,277 *(Paul Allen Foundation);* Black Turnstones and Surfbirds on Montague Island - $64,930 *(ADF&G and OSRI);* Eyak Lake monitoring - $7,784 *(Copper River Watershed Project);* Caspian Tern surveys-Copper River Delta - $10,568 (*USFWS);* Avian and bat surveys-Eyak Wind Energy project - $19,000 *(Native Village of Eyak).*

ii. KBL: The NOAA/CCFHR research focus at KBL includes the coastal ecosystem impacts of climate change, ocean acidification, and harmful algal blooms. The majority of current research efforts at KBL are conducted by visiting researchers with independent funding. Annual KBL facility funding includes approximately $350K of NOAA funds under CCFHR and $230K from UAF. KBL also led an integrated seafloor and coastal mapping project for Kachemak Bay that leveraged in-kind NOAA ship bathymetry mapping and aircraft shoreline mapping efforts.

iii. AOOS: AOOS currently receives about $2 million in funding to manage AOOS programs for coastal and ocean observations, modeling and data management, and participate in the Center for Ocean Science Education Excellence (COSEE) Alaska. Our current focus areas are ocean and coastal monitoring and ocean education.

b. Experience with Invitation area addressed by the proposal

i. PWSSC has significant experience in conducting ecological research and monitoring in Prince William Sound over the past 18 years. PWSSC principal investigators have implemented projects focused on but not limited to biological and physical oceanography, fisheries (salmon, herring and lingcod), shorebirds, and food web investigations using stable isotopes. In 1994, the center led the effort to establish the Sound Ecosystem Assessment (SEA) research program focused on herring and pink salmon in PWS. This five-year, multi-institutional and multi-disciplinary program was supported by the EVOSTC. Building on that program, the PWSSC collaborated with OSRI and other entities to establish a nowcast-forecast system in Prince William Sound. That system evolved and became the pilot project for the Alaska Ocean Observing System. PWSSC implemented the oceanographic mooring program in the major entrances to PWS with support from both EVOSTC and OSRI. It continues collection of hydrological data from the PWS through surveys included in multiple projects.

ii. KBL: The KBL Director, Kris Holderied, is an oceanographer with experience in observational coastal physical oceanography, benthic habitat mapping, satellite-based tools for coastal management, climate change impacts, environmental compliance, and weather forecasting. As KBL director since 2005, she has been responsible for science planning, facility operations, and coordination of research and education activities with multiple partners (e.g. NOAA, ADF&G, ADEC, NPS, Bureau of Indian Affairs, Alaska Native organizations, UAF, UAA, other universities, public schools and non-profit education and conservation groups). She has prior experience with NOAA, U.S. Army Corps of Engineers, and as an oceanography officer in the U.S. Navy.

iii. AOOS: AOOS has seven years experience in developing, facilitating, and managing ocean and coastal monitoring initiatives in Alaska, including the Gulf of Alaska. The primary AOOS demonstration project has been conducted over the past five years in Prince William Sound, including observations, models and forecasts, and data products, and building upon the nowcast/forecast system first developed through the SEA project. AOOS conducted a major ocean field experiment in the sound in 2009, the first of its kind to include stakeholder participation.

Tab 4 - Collaboration/Coordination

a. Experience working with state, federal and private entities

i. PWSSC has extensive experience working with state, federal and private entities (including other non-profits). The center's first major research program, Sound Ecosystem Assessment (SEA), resulted from collaborative planning sessions which included representatives from the fishing community, the University of Alaska Fairbanks, the Alaska Department of Fish & Game, the U.S. Forest Service, the Prince William Sound Aquaculture Corporation, and residents of Prince William Sound. Over the past two decades, PWSSC and the Oil Spill Recovery Institute have collaborated with more than 50 organizations to plan and implement research and education programs. For further details, see the table included at the end of this section.

ii. KBL: KBL collaborates extensively with other NOAA offices, federal state and local agencies, tribal organizations, universities, public schools, and non-profit marine and environmental education groups on research and education projects. Some examples include the following:

- Ocean acidification research: UAF, ADF&G-Kachemak Bay Research Reserve, NMFS
- Kachemak Bay and Cook Inlet mapping: NOAA ships and aircraft, multiple National Ocean Service offices, ADF&G, Cities of Homer and Seldovia, Seldovia Village Tribe, AOOS
- Tidal energy assessment in Kachemak Bay: City of Homer, NOS Center for Operational Products and Services, Ocean Renewable Power Company, Port Graham Village Council, Seldovia Village Tribe
- Marine mammal stranding: USFWS, NMFS, Alaska Sea Life Center, UAA, Kachemak Bay Research Reserve.
- Education programs (college, K-12, adult learning): UAF, UAA, Alaska Pacific University, Center for Alaskan Coastal Studies, Kachemak Bay Research Reserve, Alaska Sea Grant, public schools from Kenai Peninsula, Anchorage, Mat-Su and Fairbanks, Bureau of Indian Affairs, Project GRAD Kenai Peninsula, National Park Service, Alaska Native Science and Engineering Program and local communities.

iii. AOOS: The AOOS board consists of the heads of the federal and state resource management agencies, as well as the directors of the major research institutions in Alaska, including the University of Alaska. The organization has vast experience working with state and federal agencies. In addition, since AOOS is "stakeholder-driven", it works closely with private sector stakeholders including the oil and gas industry, shipping, commercial fishing, recreational boaters, subsistence users, and others.

b. Experience working with local and tribal communities in the spill area

i. PWSSC - PWSSC works with local communities and tribal entities on both research and education programs. Currently, the Center is working with the Cordova District Fishermen United in the PWS Herring Survey program and also collaborates, primarily with the U.S. Forest Service and the Cordova School District, in the delivery of science education programs to students. PWSSC is currently working for the Native Village of

Eyak to collect avian and bat data for a wind energy assessment project. The PWSSC educators meet periodically with NVE educators and collaborate on programs when possible. PWSSC educators schedule outreach visits to the PWS communities of Chenega Bay and Tatitlek and offer curricula and other materials to the teachers in those communities. PWSSC also periodically works with NVE, Ecotrust, the U.S. Forest Service and ADF&G on scientific workshops such as the upcoming Copper River Delta Symposium (March 22-24, 2011).

ii. KBL: KBL research, education and science literacy efforts are accomplished by leveraging partnerships with other NOAA offices, federal state and local agencies, tribal organizations, universities, public schools, and non-profit marine and environmental education groups. Local communities we have worked with in the Kachemak Bay area include the cities of Homer and Seldovia, Seldovia Village Tribe, Port Graham Village, Nanwalak Village, five Russian Old Believer communities and public schools throughout the Kenai Peninsula. KBL has also worked with the Alaska Native Science and Engineering Program, Project GRAD Kenai Peninsula and the Bureau of Indian Affairs to increase science literacy in Alaska Native and rural communities. Working with these partners, KBL supports graduate and undergraduate college classes, field science internships, teacher and tribal staff training workshops, and K-12 field science camps. For its efforts to increase science literacy in local communities, KBL received the 2010 National Ocean Service Group Award for Diversity. As an example of community partnerships, KBL collaborations with the City of Homer on a tidal energy proposal are leading to an agreement between the Alaska Energy Authority and the NOAA National Ocean Service on a tidal energy assessment of Cook Inlet.

iii. AOOS: AOOS works closely with the Alaska Native Tribal Health Consortium on climate change issues, as well as various co-management groups (belugas, harbor seals, etc.). Staff also work with local and borough governments including the Kenai and Anchorage Boroughs, and the communities of Cordova, Valdez, and Homer.

b. Outreach plan that details the types of outreach envisioned and the audience for each type
The outreach/community involvement component of this proposal will be facilitated by the Alaska Ocean Observing System (AOOS), with significant leveraging of the resources of these institutions: the Prince William Sound Science Center (PWSSC) and Oil Spill Recovery Institute (OSRI) based in Cordova, the Alaska SeaLife Center (ASLC) in Seward, and the Kachemak Bay Research Reserve (KBRR) in Homer. In addition, we will take advantage of the resources connecting scientists and educators provided through COSEE Alaska (Center for Ocean Science Education Excellence), a partnership between AOOS, the ASLC, Alaska Sea Grant Program, and the University of Alaska.

Before we can fully develop a community involvement and public outreach plan, all the components of the Long Term Monitoring Program need to be finalized. If this proposal is successful, we plan to meet first with the existing EVOS TC Public Advisory Group as well as reach out to the communities in the oil spill region to discuss various opportunities for outreach and community involvement. We also plan to coordinate our efforts closely with those for the Herring Project, which are primarily focused in Prince William Sound.

Our partner organizations offer these capabilities:

AOOS: AOOS is the only organization in the state with a board made up of all the federal and state resource management agencies and all the marine research entities in Alaska, including the University of Alaska. The AOOS mission is to coordinate and facilitate the gathering and dissemination of ocean and coastal information and data products to meet stakeholder needs in the three Large Marine Ecosystems, including the Gulf of Alaska. AOOS has committed significant resources to its web-based data portal (www.aoos.org) and data products developed in response to stakeholder needs. As part of a national - as well as a global - network of ocean observing systems, AOOS has access to significant national and international resources as well. AOOS will facilitate the outreach/community involvement program, and use its web portal as a key outlet for products to be developed.

AOOS is a major partner of COSEE Alaska, a network of ocean education and science partners that engages ocean scientists, teachers, informal educators and community members in the region in a broad range of programs, including statewide ocean science fairs, teacher workshops, Communicating Ocean Science Workshops and hands-on sessions for scientists at the Alaska Marine Science Symposium, plus distance learning and virtual field trips through the COSEE Alaska website (www.coseealaska.net).

PWSSC and OSRI: Based in Cordova, these organizations are the primary contact point for communities and education programs in the sound. The organizations' education resources will provide articles in the Delta-Sound Connections, a broadly distributed annual paper describing research in PWS and Copper River Delta. They also will develop Field Notes radio programs each year to be aired by KCHU, the PWS public radio station. The organizations will also take advantage of the PWSSC community lecture series held weekly through the winter and transmitted to Valdez through the Prince William Sound Community College. Results from the research will also be incorporated into the PWSSC classroom and summer camp activities. These camps involve youth from around Prince William Sound and the Anchorage area.

KBRR: For Cook Inlet/Kachemak Bay, the Kachemak Bay Research Reserve and the Kasitsna Bay Lab will support outreach and education services at: KBRR Discovery Labs (free-learning science education events for general public and K-12); "Bay Science" articles in Homer News, Homer Tribune and Peninsula Clarion papers; "Kachemak Currents" informational radio spots on science topics; K-12 science camps at Kasitsna Bay Lab (serving approximately 25 groups and 700 students) and marine science classes (university as well as continuing education for tribal environmental coordinators and teachers) at Kasitsna Bay Lab.

ASLC: The SeaLife Center operates America's northern-most research aquarium as a non-profit organization and is both a major marine research center and one of Alaska's largest marine tourism attractions. The ASLC has a multi-faceted formal and informal education and outreach program, employing 6 full time educators, year round and seasonal interpreters, with 2 full time exhibit design experts. These staff work closely with both in house and external scientists and educators to develop education and outreach exhibits within and outside the Center. The Center is also the designated Alaska Coastal Ecosystem Learning Center under the Coastal America Partnership – a network of some 23 aquariums nationally who receive more than 20 million visitors/year. This network is now supported by the

NOAA-Smithsonian Ocean Today Kiosk program and the ASLC has a direct daily download link to the OTK hub at the Smithsonian. The Center has a long established and interactive Exxon Valdez Oil Spill exhibit featuring the latest updates from the EVOSTC science program. This exhibit is popular, but could be readily enriched by improved interactive exhibits, expanded distance education offerings (the ASLC is currently Alaska's largest provider of marine distance education programs to lower 48 and international schools with some 300 lessons provided in 2010), shared mobile exhibit materials, and portable presentation materials on the monitoring program that could be made available to monitoring team members to use in a range of professional and school/community based presentation forums

Community involvement: Communities in the spill-affected region include both the larger communities of Valdez, Cordova, Homer, Kenai and Kodiak, as well as the smaller Alaska Native villages such as Tatitlek and Chenega, Port Graham and Nanwalek, and Kodiak Island villages. We propose to develop outreach materials specifically targeted to these communities, in essence bringing science to the communities. We propose to host mini-science symposiums in spill area communities, and contribute to the proposed Wisdomkeeper conference sponsored by spill area communities. In this 5-year proposal, we propose to begin discussions with spill-area communities (primarily Prince William Sound and lower Cook Inlet) concerning development of a potential community-based citizen science monitoring program. We propose to hold a conference on this issue in Year 2 of this proposal, and seek additional funding sources (primarily through private sources) to implement such a program that would incorporate local and traditional Alaska Native knowledge into ongoing monitoring efforts.

The table below details organizations PWSSC and OSRI have partnered with and a brief description of the nature of the collaboration.

Organization	**Governance**	**Location**	**Description / extent of collaborative activities, to date**
Alaska Clean Seas	Non-profit	Prudhoe Bay	OSRI partner for oil spill prevention research and development projects.
Alaska Department of Fish & Game	State	Cordova, Homer & Kodiak	Research partnerships on multiple years of herring and pollock population assessments, and partner in several other research and monitoring projects (shorebirds, other fisheries, invasive species); educational partner (in-kind equipment support and sharing of expertise)
Alaska Ocean Observing System	Non-profit	Anchorage	Work to promote the national ocean observing system and development of the PWS Observing System as a pilot project for Alaska
Alaska Sea Grant / Marine Advisory Program	State & Research / Educational	Cordova, Anchorage & Fairbanks	Primarily educational partnership for Cordova programs.
Alaska SeaLife Center	Non-profit	Seward	Education and research program planning.
Auke Bay Laboratory / NMFS/NOAA	Federal	Juneau	Education programs and logistical support for various research projects; research collaboration in proposals.
Bering Glacier Research Group	Academic & Research	New York & Alaska	Logistical support and education program sharing over a 17 year period.
Center for Alaskan Coastal Studies	Non-profit	Homer	Education program planning for regional projects.
Chugach Alaska Corporation	Corporate	Anchorage	Meteorological station at Nuchek on Hinchinbrook Island.
Chugach School District	Educational	Anchorage	Outreach education programs provided to Tatitlek, Chenega Bay and, in the past, Whittier schools.
Coastal Resources Research Center / Univ. of New Hampshire	Academic & Research	Durham, NH	OSRI partner for oil spill prevention research and development projects.
Cook Inlet Regional Citizens' Advisory Council	Non-profit	Kenai	Sharing of resources (drifter buoys) for 2004 field experiment.
Copper River Watershed Project	Non-profit	Cordova	Education programs primarily.
Cordova District Fishermen United	Non-profit	Cordova	Meteorological station on Copper River Delta and consultative support on various fisheries related research projects.
Cordova School District	Educational	Cordova	All elementary school classes participate monthly in Discovery Room programs; high school science classes welcome programs by PWSSC educators and researchers.
Dalhousie University	Academic	British Columbia	Collaboration on Steller sea lion research programs.
Dauphin Island Sea Lab - University of South Alabama (USA)	Academic	Alabama	Partnership began in 2000 between two PWSSC and USA researchers who collaborate on projects focused on the Copper River Delta. Regular visits for fieldwork by the P.I. and graduate students. PWSSC researcher now pursuing a Masters Degree at USA.
Ecotrust	Non-profit	Portland	Planning for research and education programs; Ecotrust staff have volunteered many years of service on PWSSC Board of Directors.
Exxon Valdez Trustee Council	State & Federal	Anchorage	Supports research programs in PWS and CRD region.
Kachemak Bay National Estuarine Research Reserve	State & Research / Educational	Homer	Informal communications on programs; collaboration on education program planning.
Kastina Bay Laboratory / NOAA	Federal	Homer	Informal communications on programs.

Minerals Management Service	Federal		OSRI partnership programs for oil pollution prevention and mitigation.
National Data Buoy Center	Federal	Mississippi	PWSSC purchased 2 Acoustic Doppler Current Profilers for deployment on NDBC buoys in PWS; NDBC installed the ADCPs and now provides real-time data
National Fish & Wildlife Foundation	Non-profit	Portland & Washington, D.C.	Support for shorebird research projects.
National Marine Fisheries Service	Federal	Juneau	Grant oversight by NMFS personnel for Steller sea lion and EVOS-funded projects.
National Science Foundation	Federal	Washington, D.C.	PWSSC researcher participated in 5-year North Pacific GLOBEC program
Native Village of Eyak	Non-profit	Cordova	Education programs.
Natural Resources Conservation Service	Federal	Anchorage	Planning, installation and maintenance for meteorological stations in PWS and on the CRD.
NOAA Habitat Conservation Division & NOAA Restoration Center	Federal	Anchorage	Research to evaluate an artificial reef in Whittier as a restoration and fish-habitat enhancement tool.
NOAA Hazmat Division	Federal	Anchorage & Seattle	Research and education planning for oil spill related programs.
North Pacific Research Board	Research	Anchorage	Supports research programs in PWS and CRD region.
North Pacific Universities Marine Mammal Consortium	Academic & Research	Vancouver, British Columbia	Steller sea lion research projects.
PRBO Conservation Science	Non-profit	Petaluma, California	Multi-year partner in various shorebird monitoring projects.
Prince William Sound Aquaculture Corporation	Non-profit	Cordova	Partnership for support of two meteorological stations in PWS and research planning for fisheries related projects.
Prince William Sound Community College	Academic	Cordova & Valdez	Partner in the Science of the Sound program; provides class and storage rooms for the program year-round.
PWS Fisheries Research, Application & Planning Group	Non-profit	Cordova	Research program planning.
PWS Regional Citizens' Advisory Council	Non-profit	Anchorage & Valdez	Research and education program planning. Partnerships on various research projects.
Raytheon / Jet Propulsion Laboratory	Research	Los Angeles	Ocean circulation modeling research within the PWS Observing System program.
Rosentiel School of Fisheries & Atmospheric Science / University of Miami	Academic	Miami	Ocean circulation modeling research within the Nowcast/Forecast and later the PWS Observing System program.
Texas A&M University	Academic	Galveston	Wave modeling research within the PWS Observing System program. One former and one current PWSSC researcher have pursued their doctoral degress at Texas A&M.

U.S. Coast Guard	Federal	Cordova, Kodiak & Juneau	Planning, vessel and helicopter support for various research and education programs.
U.S. Fish & Wildlife Service	Federal	Anchorage	Planning and partnerships on various research and education programs.
U.S. Forest Service	Federal	Cordova & Anchorage	Partnership since 1991 for Science of the Sound education programs; several shorter-term research projects during same period.
U.S. Geological Survey	Federal	Anchorage & Vallejo, Calif.	Planning and partnerships on various research programs.
University of Alaska Anchorage / Alaska Experimental Forecast Facility	Academic	Anchorage	Development of predictive atmospheric model within the PWS Observing System program.
University of Alaska Fairbanks	Academic	Fairbanks	Collaborations with various researchers through the SEA investigations and, more recently, on herring related projects. IMS/UAF representative serves on OSRI's Board and various UAF researchers have served on the PWSSC Board.
University of Alaska Southeast	Academic	Juneau	Limited communications; PWSSC staff served on doctoral student's committee and have given guest lectures a few times. Collaboration by several PWSSC researchers with UAJ on an unsuccessful LTER proposal submitted in 2004.

Tab 5 - Budget Request

The overall budget request for the Long-Term Monitoring Program is $10,565,910 expended over 5 years.

a. PWSSC requests a flat $200,000 annual administrative fee in lieu of modified indirect cost to manage the Long-Term Monitoring Program. Of the total 13 projects composing the LTM program, two are led by PWSSC researchers; PWSSC waives the modified indirect costs associated with these two projects (totaling $72K/year average).

   Administrative tasks PWSSC assumes responsibility for include: general administrative support to the Team Leader; logistics coordination of project meetings (travel and meeting location setup); management of all contracts and subawards for non-Trustee organizations involved in this program (this will total 6 or 7 contracts in addition to the 2 PWSSC projects); timely submission of financial reports; completion of annual audits; and monitoring of project spending.

   This budget assumes that funding to Trustee agencies will be provided directly to that agency and not through the PWSSC. Routing funds for Trustee agencies through the PWSSC will cause significant increases in overhead costs and may incur difficulties in transferring funding from a non-profit organization to a state or federal agency. All non-Trustee organizations involved in this proposal are included as subcontracts to the PWSSC.

   Costs associated with the formation and operation of a scientific review panel for the LTM program is included in the administrative fee. Public involvement and outreach, and information technologies/data management expenditures are included in the direct line items for these programs.

   The travel portion of the administrative budget includes funds for an annual meeting in Anchorage of the project principal investigators. Also included are travel funds for the scientific review panel and for outreach purposes.

   The first annual administrative budget is shown on the next page.

Below is the proposed Year 1 Administrative budget; Years 2-5 will not exceed $200K per year.

PWSSC Administrative Budget - Year 1

Personnel - salaries/benefits	FTE 1 - salary & benefits	FTE charges to LTM	
Bookkeeper	65,100	FTE.6	39,060
Fin Direct	100,750	FTE.25	25,188
Exec Direct	155,000	FTE.20	31,000
Admin Asst	58,900	FTE.25	14,725
IT support	85,250	FTE.25	21,313
		Total Personnel	***131,285***
Supplies			
Misc. office supplies			1,500
Computer and/or software			2,500
		Total Supplies	***4,000***
Services			
Phone			2,500
Electricity			5,000
Space rent			8,000
Vehicles			750
Postage			465
Audit share			8,000
Insurance			1,500
		Total Services	***26,215***
Equipment			
		Total Equipment	***0***
Travel			
Travel for Admin staff to Anchorage			1,500
Travel for Team Leader - contingency			5,000
Travel for science/technical review mtgs			10,000
Travel for outreach related mtgs			10,000
LTM annual project mtg in Anchorage			
10 PIs airfare plus 2 nights hotel & food			10,000
Meeting space rental			2,000
		Total Travel	***38,500***
		GRAND TOTAL	**$200,000**

b. The overall program budget is detailed in the table below and is further described in the narrative proposal. Line item details for each project budget are available on request.

Table showing LTM program budget by various focus areas and annual costs

Long-Term Monitoring Proposal Budget - 2011-2016

Activity (Costs in $K)	Yr1	Yr2	Yr3	Yr4	Yr5	5 Yr TOTAL
Environmental Drivers						
Prince William Sound Oceanographic	218.400	177.212	181.802	186.577	191.545	955.536
GAK1 (Gulf of Alaska)	100.000	103.000	106.000	109.000	112.000	530.000
Seward Line	90.000	54.942	92.215	95.433	98.802	431.392
Lower Cook Inlet Oceanographic	150.000	150.000	150.000	132.000	132.000	714.000
Continuous plankton recorder (CPR)	0.000	61.286	63.125	65.019	66.969	256.399
Environmental Drivers Total	***558.400***	***546.440***	***593.142***	***588.029***	***601.316***	**2,887.327**
Pelagic Monitoring						
Killer whale monitoring		122.000	122.000	122.000	122.000	488.000
Humpback whale monitoring	122.000	122.000	122.000	122.000	55.000	543.000
Forage fish	193.000	186.000	186.000	186.000	137.300	888.300
Seabird monitoring	150.000		300.000		150.000	600.000
Bird synthesis	30.000					30.000
Seabird monitoring	47.400	72.100	74.258	76.457	79.135	349.350
Pelatic Monitoring Total	***542.400***	***502.100***	***804.258***	***506.457***	***543.435***	**2,898.650**
Benthic Monitoring						
Nearshore benthic PWS (sea otters, seagrass/kelp, intertidal invertebrates/algae, benthic voraging seabirds)	282.450	304.110	331.905	309.560	331.905	1,559.930
Kachemak Bay Intertidal	44.000	44.000	44.000	44.000	44.000	220.000
Benthic Monitoring Total	***326.450***	***348.110***	***375.905***	***353.560***	***375.905***	**1,779.930**
Coordination, Data Management, Outreach and Administration						
Administration and meeting logistics	200.000	200.000	200.000	200.000	200.000	1,000.000
Data Management	150.000	150.000	150.000	150.000	150.000	750.000
Science Synthesis/Coordination	200.000	200.000	200.000	200.000	200.000	1,000.000
Outreach	50.000	50.000	50.000	50.000	50.000	250.000
Coord., Data Mgt, Outreach & Admin.	***600.000***	***600.000***	***600.000***	***600.000***	***600.000***	**3,000.000**
Overall Program Total Cost	**2,027.250**	**1,996.650**	**2,373.305**	**2,048.046**	**2,120.656**	**10,565.907**

See next page for Lingering Oil Monitoring Budgets

Lingering oil Monitoring	Yr1	Yr2	Yr3	Yr4	Yr5	5 Yr Total
1 - Extending Tracking levels of oil composition and weathering (PAH levels) in PWS through time	18	12	155.2	8	6	199.2
2a - Evaluating the Chronic Exposure of Harlequin Ducks to Lingering *Exxon Valdez* Oil in Western Prince William Sound	101.85					101.85
2b - Evaluating the Chronic Exposure of Sea Otters to Lingering *Exxon Valdez* Oil in Western Prince William Sound	85.5					85.5
Total Lingering Oil Monitoring						**386.55**

APPENDIX 1. MONITORING PROJECT DESCRIPTIONS

LONG-TERM MONITORING: ENVIRONMENTAL DRIVERS
Principal Investigators

Sonia Batten
Sir Alister Hardy Foundation for Ocean Science
c/o 4737 Vista View Cr
Nanaimo, BC V9V 1N8
Canada

Rob Campbell
Prince William Sound Science Center
PO Box 705
Cordova, AK, 99574

Angela Doroff
Alaska Department of Fish and Game
95 Sterling Hwy, Suite 2
Homer AK 99603

Kris Holderied
NOAA Kasitsna Bay Laboratory
National Ocean Service/ Center for Coastal Fisheries and Habitat Research
2181 Kachemak Drive
Homer, AK 99603

Russell Hopcroft and Thomas Weingartner
Institute of Marine Science
University of Alaska
Fairbanks, AK 99775

Introduction

The marine ecosystems of the Gulf of Alaska (GOA)and the adjoining fjords and inland passageways vary on seasonal, inter-annual, and inter-decadal time scales in response to both natural and anthropogenic influences. This variability is large at each of these time scales and quantifying it requires a long-term commitment to sustained measurements. For example, over the last several decades we have seen changes in the physical properties of GOA waters that were coincident with the demise of shrimp, king crab and herring and the increase in pollock. Quantifying this variability and understanding its causes and ramifications is essential to effective management and maintenance of these marine systems. In addition, long-term measurements provide the necessary information required to evaluate the efficacy of management strategies and restoration activities. The goal of the long-term monitoring program is to provide society, resource management agencies, and the science community with the knowledge and mechanistic understanding necessary to conserve, protect, restore and manage the marine ecosystems of the northwest Gulf of Alaska.

The "environmental drivers" component of the long-term monitoring effort specifically examines physical oceanographic and lower trophic variability in these marine ecosystems. It supports the upper trophic level monitoring, herring restoration, and lingering oil components of the broader program by providing the environmental context under which these other programs are conducted. It also provides the information essential for synthesizing the results from these other program elements into a conceptual model of ecosystem function and change needed in designing management strategies and evaluating restoration efforts.

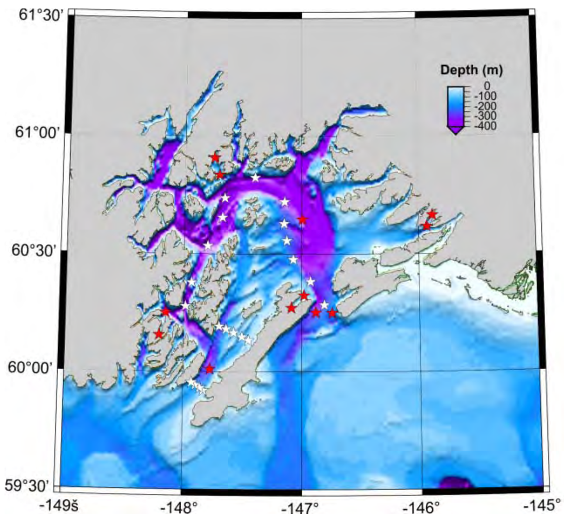
The "environmental drivers" is a coordinated effort involving both long-term observations and spatial analyses. The former describes and quantifies temporal variability, while the latter examines how changes vary on spatial scales ranging from the broad scale, e.g. the continental shelf, to smaller scales, e.g., Prince William Sound (PWS), lower Cook Inlet (CI), and their adjacent bays. The rationale behind this approach is that PWS, CI, and adjoining bays and fjords all communicate with the GoA shelf. That communication involves water exchanges that affect not only the temperature and salinity properties of these water bodies, but also their nutrient loads and their plankton communities. Consequently, the exchanges organize the lower trophic levels, determine their productivity, and ultimately, configure the upper levels of the food chain. Measurements of the shelf environment reflect variability at the largest scale relevant to the "environmental drivers" monitoring effort for it reflects the integrated forcing by the atmosphere, coastal freshwater runoff, and exchanges with the deep GoA basin. These processes establish the physical conditions upon which lower trophic level production occurs. They also establish the seasonally-varying circulation over the shelf, which primarily involves the Alaska Coastal Current. This current exerts dynamical control on exchange between PWS and lower CI, indeed portions of the current flow through both regions, leading to substantial alteration of water properties and phytoplankton communities on seasonal and shorter time scales. The shelf source waters are also modified by biological and physical processes occurring within PWS and CI. Hence, while the shelf sets the stage for production at both large and small scales, local processes can substantially modify productivity at the smaller scales. By monitoring at several spatial scales we can assess the relative influences on lower trophic level production of both broad (shelf) scale and small scale forcing.

Our proposed monitoring program builds upon existing time series sponsored previously under the aegis of EVOSTC or other agencies. For example, zooplankton and physical oceanographic data were sporadically collected from Prince William Sound in the 1970s and 1980s, with more regular sampling evolving in the aftermath of the oil spill. The EVOSTC sponsored Sound Ecosystem Assessment (SEA) project ran from 1994 to 1997, and was the first comprehensive ecosystem-level study of PWS, aimed at understanding why impacted resources had not recovered. Sound sampling also occurred under the NSF-NOAA sponsored Global Ocean Ecosystem Dynamics (GLOBEC) program, which included sampling in the western Sound and offshore Hinchinbrook Entrance and along the Seward Line over the shelf (Figure 1). GLOBEC sampling involved 6 – 7 cruises per year between 1998 and 2004 and focused on physical-chemical dynamics, phytoplankton production, and zooplankton community structure, abundance, biomass and production. With support from the North Pacific Research Board (NPRB) and most recently AOOS, sampling at these stations has continued twice annually (May and September) along the Seward Line and in the Sound so that this time series is now 13 years old. Investigators from the Prince William Sound Science Center (PWSSC) and Oil Spill Response Institute (OSRI) have done oceanographic surveys and deployed moorings in central PWS and the entrances since the mid-1990s. Under EVOSTC support, Continuous Plankton Recorder (CPR) collections of zooplankton have been made along a transect extending from Lower Cook Inlet, across the shelf and into the GoA basin. This 11-year time series is documenting changes in zooplankton community patterns over various spatial scales and ocean domains. . In Kachemak Bay hourly water quality and meteorological data is available from 2001 to present at Kachemak Bay Research Reserve stations, along with temperature and salinity profile data collected in Kachemak Bay and lower Cook Inlet and near-surface salinity and temperature data on ferry routes from lower Cook Inlet to Kodiak. The physical monitoring in Cook Inlet and Kachemak Bay complements 10-year time series of intertidal invetebrate and macroalgae monitoring near the Kasitsna Bay Laboratory, state and federal agency monitoring of otters, shellfish and other near-shore resources, and citizen-based monitoring of seabirds and marine mammals. Finally, our proposed program includes continuing the now 40-year time series of water column temperature and salinity measurements from the GAK 1 station at the mouth of the Resurrection Bay and at the inshore end of the Seward Line. These data provide an index of Alaska Coastal Current mass, freshwater, and heat transports, renewal of inner shelf waters from the continental slope and provide an indicator of large-scale atmospheric forcing of the shelf over the northern Gulf of Alaska.

Environmental Drivers Study Team.

Several groups constitute the long-term monitoring team. Each member of the team has provided a more detailed synopsis of their proposed monitoring in the appendix. Here we simply introduce each proposed monitoring project and the study regions (Figure 1). Regional-scale measurements will be made in Kachemak Bay/lower CI and PWS. A. Doroff and K. Holderied will conduct regional-scale measurements in Kachemak Bay and CI including physical oceanographic measurements using a combination of moorings and monthly measurements of water column temperature and salinity (CTDs) and plankton. Their work complements proposed long-term monitoring of benthos (invertebrates, macroalgae and otters) being made by B. Konar and K. Iken and proposed to be continued in the EVOSTC-funded monitoring program. Measurements in PWS will be undertaken by R. Campbell and R. Hopcroft. Campbell will maintain a bio-physical mooring in the central Sound year-round, He will also and occupy 12 CTD stations, 6 times per year to collect temperature and salinity, nutrient, phytoplankton, and zooplankton samples in support of the herring research project led by Scott Pegau and submitted to this announcement. Many of the stations are located in bays where herring studies will be performed. Hopcroft's efforts focus on both the GoA shelf and PWS. He will occupy the Seward Line transect that runs from the mouth of Resurrection Bay (Seward, Alaska) southward 150 miles offshore to the continental shelf and 11 PWS stations. His program consists of two cruises per year, in early May and early September, to capture the typical spring bloom and summer conditions, respectively. He measures the physical-chemical structure (including monitoring for ocean acidity), phytoplankton production and the distribution and depth-specific abundance of zooplankton. The two PWS-centric efforts will coordinate their sampling efforts to avoid overlap, and the complimentary data collected will ultimately permit testing for broader links between PWS and the coastal GoA. Broader scale measurements are proposed by S. Batten and A. Bychkov. Her sampling involves continuous plankton recorders deployed from commercial cargo vessels on monthly transects extending from Cook Inlet, across the continental shelf, and into the GoA basin. This transect intersects with the outermost stations of the Seward

Line. She will determine if there are spatially different zooplankton community responses to broader scale forcing. Since many of these zooplankters are prey forage for herring, salmon and a variety of fishes and seabirds, her work will enable us to understand if zooplankton success or failure is locally confined or part of a broader pattern. Finally, T. Weingartner proposes to maintain the 40-year long time series at station GAK 1 at the mouth of Resurrection Bay. This station provides an index of the volume, heat, and freshwater transport in the Alaska Coastal Current and thus represents an element of the broad-scale detection of variability.



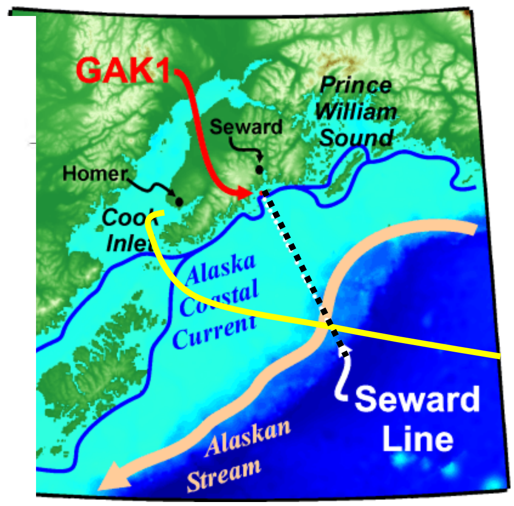


Figure 1. Map of PWS (left) and the northwest GoA shelf including the Alaska Coastal Current and Alaskan Stream, in relation to Prince William Sound and Cook Inlet. The PWS map shows the location of proposed stations to be sampled by Campbell (red) and Hopcroft (yellow: standard stations; white stations will be added for this program), and the PWS mooring (green). The GoA map shows the locations of station GAK1, the Seward Line (dotted), and the transect line (yellow) of the cargo vessels towing the continuous plankton recorder (CPR).

***Non_EVOSTC Linkages*.**

Several other organizations and agencies are contributing to this effort either directly or indirectly. The CPR survey is supported by a funding consortium managed by the North Pacific Marine Science Organisation (PICES) of which the EVOSTC is a current member. More than half of the costs of the CPR transect described here are provided by other consortium members. Station GAK 1 measurements include some equipment provided by AOOS. The consortium that contributes to the Seward Line includes NPRB, AOOS and NOAA.

Five Year Goals:

Our goals during the first five years include data synthesis within the team and with other components of the program. Questions that team members will address as part of the environmental drives program are:

1. How does temperature and salinity variability compare (and covary) among sites?
2. What are the spatial variations in the establishment and erosion of density stratification in spring and autumn respectively, that leads to spring and autumn phytoplankton blooms?
3. How do zooplankton community assemblages and abundances vary spatially and from year to year?

4. Are the changes in zooplankton abundance and composition correlated with the timing of the spring bloom and/or changes in water property variables (temperature, salinity, nitrate).

We will also collaborate with other program elements to address the following issues:

5. Are herring and forage fish overwintering success tied to the productivity during spring and summer, and seasonal or inter-annual differences in zooplankton community structure and species abundances?
6. Are herring and forage fish overwintering success associated with winter conditions on the shelf and/or in the sound?
7. Are variations in seabird abundance and distribution associated with zooplankton stocks and/or oceanographic conditions?
8. Are oceanographic trends in the outer GOA shelf mirrored in the near-shore marine system where monitoring of injured or adversely impact recovered resources are being monitored?

Collectively our group and the other groups involved in other monitoring activities and herring research plan on an annual meeting in Anchorage to share data, integrate results, and examine questions 5 – 8. The environmental drivers group will also meet electronically and/or via teleconference to synthesize our findings and to address issues 1 – 4 (funds requested in this set of project proposals do not include travel for meetings and data synthesis). Additional issues and will undoubtedly emerge at these meeting as findings from the various data sets evolve.

ENVIRONMENTAL DRIVERS: PROJECT SYNOPSES

Proposal synopsis: Long-term Monitoring of zooplankton populations on the Alaskan Shelf and Gulf of Alaska using Continuous Plankton Recorders.
Sonia Batten soba@sahfos.ac.uk **and Alex Bychkov** (bychkov@pices.int), **Principal Investigators**

Justification
The Continuous Plankton Recorder (CPR) transect samples the Alaskan shelf and crosses the slope into the open Gulf of Alaska, providing a record of taxonomically resolved near-surface zooplankton and large phytoplankton abundance over wide spatial scales. Many important species, including herring, forage outside of Prince William Sound for at least some of their life history (salmon, birds and marine mammals for example) so an understanding of the productivity of these shelf and offshore areas is important to understanding and predicting fluctuations in resource abundance. Our sampling transect extends from the inner part of Cook Inlet, onto the open continental shelf, across the shelf break and into the open Gulf of Alaska in a continuous fashion (Figure 1), enabling us to identify where the incidences of high or low plankton are and whether the whole region is responding in a similar way to meteorological variability. Evidence from CPR sampling over the past decade suggests that the regions are not synchronous in their response to ocean climate forcing.

Figure 1 Location of samples on a typical CPR transect (○) together with the Seward Line (+)

The funding requested is modest and because of the Consortium approach (the North Pacific CPR program is funded through a consortium managed by the North Pacific Marine Science organization, PICES) is less than half the actual cost of the data collection. The project has a proven track record with a high sampling success rate, all past deliverables have been fully met and there is a strong record of primary publications resulting from the program; the funding would likely generate a very positive return for the EVOS TC. SAHFOS has trained local technicians to service the CPRs and uses the Horizon shipping company for the sampling so that ~10% of the requested funding will be returned to the region.

Project Objectives
The fundamental goal of this program is to provide continued large spatial scale data on zooplankton populations to extend the existing time series and integrate the data with more regional, locally more intensive, sampling programs. More specifically, we will provide monthly (spring to fall – typically April to September) sampling of zooplankton and large phytoplankton along the transect from the oceanic Gulf of Alaska to Cook Inlet, analyzing every 4th oceanic and every shelf sample to provide taxonomically resolved abundances. Temperature loggers have been fitted to some CPRs in the past and from 2010 we are endeavouring to maintain in situ temperature data collection on this transect.

Project Integration
Work is currently underway to compare the CPR sampling with historic and concurrent plankton data collected from within PWS to examine the links between zooplankton within and outside of

the Sound under EVOS TC project 10100624, as part of the herring restoration program. This would continue within the current proposed work as only a short time series of taxonomically resolved plankton data from PWS will be generated by 2012. We also here propose to integrate CPR sampling with the twice-yearly zooplankton sampling along the Seward Line (which intersects the CPR transect at its outermost stations, Fig 1) and the continuous oceanographic framework provided by the GAK-1 sampling.

CPR sampling has strengths (robust, cost-effective and large scale) but it also has limitations (near surface sampling only, small sample volumes and robust sampling mechanism that may cause underrepresentation of rarer and/or fragile organisms). The PWS and Seward Line zooplankton sampling are complementary by providing spatially detailed, full water column sampling in key point locations. The Seward Line sampling is carried out twice/year so the monthly resolution of the CPR will fill-in information on seasonality of shelf and off shore lower trophic levels.

Leveraging

PICES has endorsed the North Pacific CPR project since its inception in 2000. In 2007 PICES initiated a funding consortium to support the project, through relatively small contributions from agencies with interest in all or part of the region. At this time, the Canadian Department of Fisheries and Oceans (DFO) and the North Pacific Research Board (NPRB) have each made commitments through 2014 and we are also supported by the CPR parent organization, SAHFOS. The EVOSTC was instrumental in the establishment of the CPR program and has supported it through projects 030624, 040624, 070624 and currently to the PICES consortium through project 10100624 which extends through the 2012 field season.

Project Approach and Logistics

We do not propose to make any changes to the sampling regime that has been operating so successfully. The cargo vessel *Horizon Kodiak* will tow a CPR northbound towards Cook Inlet approximately once per month between April and September each year. The samples will be unloaded and the gear serviced each time by Alaskan technicians who have been trained by SAHFOS. Sample processing will be carried out at the DFO laboratory in Sidney, BC and at the SAHFOS laboratory. QC and sample archiving will be carried out by SAHFOS.

Budget

Funding is already provided for the 2012 field sampling and work up, under the existing project 10100624. Costs below are for 2013 onwards and commence at a similar level to 2012. Modest annual inflationary increases are requested for subsequent years (3%).

Proposal synopsis: Long term monitoring of oceanographic conditions in Prince William Sound

Rob Campbell, PWS Science Center rcampbell@pwssc.org

Justification

Marine ecosystems are not static over time, they change gradually from year to year, or shift abruptly; those changes are in part driven by bottom up factors, such as environmental changes (e.g. temperature, salinity, turbidity), and biogeochemical interactions (the availability and recycling of nutrients). Long term monitoring of the spill-effected area is therefore important, both in order to assess the recovery of resources, and to understand how the ecosystem is changing over time.

The ecosystems of the PWS region are influenced by physical environmental factors: metabolic and other vital rates for lower trophic species are generally temperature controlled. Water column production is ultimately limited by the amount of nitrogen annually available to primary producers. Nitrogen abundance is influenced by stratification (i.e. the onset of a seasonal thermocline or halocline) and mixing processes. These physical factors vary in space and in time: different locations have different drivers (e.g. tidewater glaciers vs riverine estuaries, watersheds of varying size), and parameters change both inter- and intra-annually. Superimposed over all those changes in the physical environment are myriad changes in the marine ecosystem, both in terms of the constituents (who is there) and abundance (how many there are, or their biomass). The phenology of ecosystem components (the timing of who appears) is also important, particularly with regards to matches and mismatches between predators and prey.

Project objectives

The goal of this program is to deliver a monitoring program that will return useful information on temporal and spatial changes in the marine environment, at a reasonable cost, and with a reasonable amount of effort. The data should be depth-specific (because stability is important), of high enough frequency to capture timing changes (changes are typically on order of weeks), and give an idea of spatial variability in the region. As well, given that PWS herring will remain a funding priority of the EVOSTC in the next 20 years, any long term monitoring efforts should be integrated with future herring studies as well as building upon ongoing work funded by the trustee council. Specific objectives include:

1. Install and maintain an autonomous profiling mooring in PWS that will measure daily profiles of temperature, salinity, chlorophyll-a (as a proxy for phytoplankton biomass), turbidity and nitrate concentration in the surface layer (0-100 m).
2. Conduct regular surveys in PWS to tie in spatial variability to the high frequency time series provided by the mooring.
3. Support continued herring research by maintaining the existing time series (hydrography, plankton and nutrients) at the four SEA bays, and participating in intensive process studies of juvenile herring overwintering.

Project integration

This project links directly with the herring research program submitted separately to the Trustee Council by Scott Pegau et al, it will provide a bottom up context for the proposed work on juvenile herring. This project also links materially with the Lower Cook Inlet/Kachemak Bay long term monitoring effort: plankton and nutrient samples collected under that program will be analyzed at PWSSC.

<u>Leveraging</u>
This program will collaborate closely with the Alaska Ocean Observing System, which has funded some prior surveys in PWS, and is currently funding oceanographic and ecosystem modeling in the region. A proposal was submitted in October 2010 for FY11-15 activities, which included thermosalinograph cruises in PWS that are complementary to the work proposed here. Some of the instrumentation and equipment used in this project was initially purchased with AOOS funds.

<u>Project approach and logistics</u>
The central PWS mooring is best located near Naked Island (Figure 3), to the west of an existing sampling station in the central sound (the current station is between tanker lanes, not a good location for a mooring) and co-located with a Seward Line sampling site (see Hopcroft project proposal. The mooring will be an Autonomous Moored Profiler (AMP, WetLabs, Inc.). The AMP is self-contained, and is capable of profiling from 100 m to the surface, with multiple deployments per day and a longevity of 3-4 months. The instrument payload on the AMP includes a CTD, a fluorometer/turbidometer, and a UV nitrate analyzer (a Satlantic SUNA); data will be telemetered out in near real-time by cellular modem.

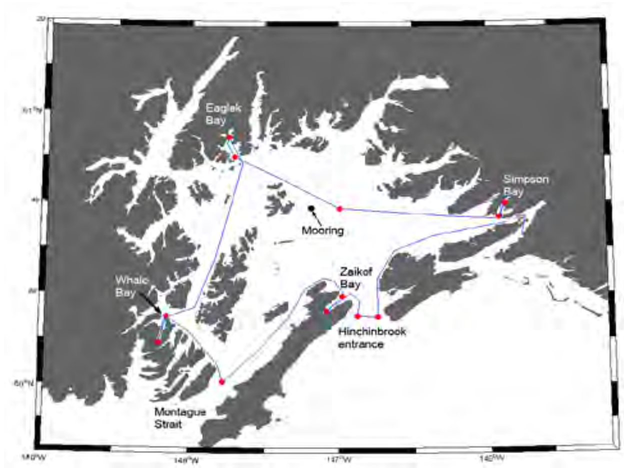


Figure 3. Proposed mooring location, cruise track and station locations visited during vessel surveys.

Vessel surveys will be conducted 6 times per year, and will visit the four SEA bays that have been a focus of prior EVOSTC funded research (and a focus of the Pegau et al. herring proposal), as well as Hinchinbrook Entrance and Montague Strait (as requested by the RFP), and central PWS (to collect ground-truth data and to service the mooring). Each station will include a CTD cast (with the same instrumentation as on the mooring), water bottles for nutrient and chl-a analysis, and a plankton tow. Two stations will be done in the bays, one near the head where juvenile herring are more frequently encountered, and one in more open waters at the mouth of the bay. The timing of the surveys will be structured around the "productivity season" to attempt to capture the spring and autumn blooms (i.e. pre-bloom, bloom and post-bloom). The data collected during the surveys (particularly phytoplankton abundance and nutrient concentration) will be compared to the high frequency record in the central sound, in order to assess how the timing and magnitude of production events in the bays differs from the open waters of PWS. Stage composition of the copepod species sampled by the plankton net will also give information on phenology.

The Pegau et al. herring program is also proposing to do a number of focused process studies in the four SEA bays. Not all plankton is equal quality food to herring, and the plankton data will inform work done on herring energetics. Hydrographic, nutrient and plankton sampling will also be done during intensive overwintering juvenile surveys done by members of the herring program in Simpson Bay and Port Gravina.

Proposal synopsis: Long-term monitoring of oceanographic conditions in Cook Inlet/Kachemak Bay to understand recovery and restoration of injured near-shore species

Principal Investigators: Angela Doroff, Kachemak Bay Research Reserve, angela.doroff@alaska.gov and Kris Holderied, NOAA Kasistna Bay Laboratory, kris.holderied@noaa.gov

Justification

The proposed lower Cook Inlet/Kachemak Bay monitoring project is designed to assist in the evaluation of recovery and restoration of injured resources in the foot print of the *Exxon Valdez* oil spill (EVOS) by determining if oceanic conditions and changes in the Gulf of Alaska are synchronous with near-shore trends at multiple sites. Kachemak Bay, like PWS, has been impacted by the EVOS and has similar physical stressors on near-shore coastal habitats such as land-level changes from the 1964 earthquake and isostatic rebound from melting glaciers. This project will leverage and expand several long-term (10 year and longer) physical and biological monitoring data series in Kachemak Bay and benefit from current development of an operational NOAA ocean circulation model in lower Cook Inlet. The project goal is to monitor oceanographic conditions in lower Cook Inlet and Kachemak Bay, at scales that will improve understanding of environmental conditions which may inhibit full recovery of injured resources or adversely impact recovered resources. We propose to continue and enhance oceanographic monitoring in Kachemak Bay and lower Cook Inlet, to provide the foundation of a comprehensive restoration monitoring program for this region of the oil spill affected area. This physical monitoring will complement proposed Cook Inlet benthic species monitoring (invertebrates, macroalgae, sea otters -see Konar et al proposal in Benthic Monitoring section), as well as shellfish surveys by ADF&G. Because of the rich data history in Kachemak Bay and lower Cook Inlet, pairing the physical and biological near-shore monitoring will facilitate understanding of the impacts of environmental drivers throughout the spill-affected area.

Project objectives

We propose to enhance existing oceanographic monitoring programs to correlate near-shore monitoring of injured resources with annual and seasonal patterns and trends in oceanographic conditions in lower Cook Inlet. Specific objectives include:

1. Improve understanding of water mass movement in Kachemak Bay
2. Determine linkages, and temporal variability in those links, between Kachemak Bay/lower Cook Inlet, the Alaska Coastal Current and PWS (using oceanographic data from PWS, GAK1 mooring, Seward Line and GOAIERP shipboard sampling along the shelf adjacent to Cook Inlet).
3. Examine the short-term variability and track long-term trends in oceanographic and water quality parameters and plankton communities.
4. Provide environmental forcing data for correlation with biological data sets.

Project integration

To aid in interpreting the relative effects of oceanic and estuarine changes on the status and trends of injured resources in the near-shore environment, data from this effort will be related to oceanographic monitoring in Prince William Sound (Campbell proposal) and the outer Kenai Peninsula coast (Weingartner and Hopcroft proposals) and overlapping data from two years of the NPRB-funded Gulf of Alaska Integrated Ecosystem Research Project (GoAIERP). The

Kachemak Bay Research Reserve (KBRR), a State of Alaska and NOAA partnership, has 10 years of water quality and meteorological data, temperature and salinity profile data, and near-surface salinity and temperature data on ferry routes from lower Cook Inlet to Kodiak. Water level and temperature data are available fromthe NOAA tide station at Seldovia from 1964 to present. Complementing the physical data, annual intertidal invertebrate and macroalgae monitoring has been conducted at sites near Kasitsna Bay Laboratory (KBL) for 9 and 10 years (also see Konar et al proposal). Other data sets, including extensive sea otter and shellfish surveys, also overlap the time periods of the physical data records in this area. .

Leveraging

KBRR provides resources for continuous monitoring of water quality and meteorological data and our project will leverage and enhance that existing program. This project will also leverage historical oceanographic and biological data described above, which facilitates a data synthesis within the first 3 years of this project, that will support the year 3 joint workshop between the long-term monitoring and herring programs. A Cook Inlet circulation model being developed by the NOAA Coast Survey Development Laboratory and scheduled to be operational in 2013 will help integrate the oceanographic data in space and time. Collectively, KBRR and KBL will contribute $130K per year match to this project.

Project approach and logistics

The proposed oceanographic monitoring in Kachemak Bay will combine: 1) continuous data from existing KBRR water quality monitoring stations (YSI sondes measuring temperature, salinity, dissolved oxygen, turbidity, pH) at the Homer and Seldovia harbors; 2) an additional shoreline water quality station to be deployed during ice-free months in Bear Cove (near head of Bay); and 3) monthly small-boat surveys of temperature and salinity profiles, using conductivity and temperature vs Depth (CTD) instruments on lines across from the Homer Spit and from Barabara Point in outer Kachemak Bay (see Figures 5 and 6). The data collected in year 1 and 2 of the project will be analyzed for spatial and temporal (seasonal and annual) patterns, to determine if deployment of moored instruments could be used as an alternative in the final three years of the project and beyond. KBRR and KBL small boats will be used for Kachemak Bay sampling.

Oceanographic monitoring in lower Cook Inlet will include boat transects of CTD and plankton sampling, conducted quarterly on lines across the entrance of Cook Inlet and northwest from Anchor Point (see Figure 5). A third line from Augustine Volcano to Flat Island may be sampled as an alternative to sampling the entrance line twice on a given survey (dotted line on Figure 1). The sampling design leverages existing CTD survey data collected along these lines, as well as four other transects in lower Cook Inlet. The Barabara Point line of the Kachemak Bay survey will also be sampled during the Cook Inlet oceanographic surveys. Chartered boats will be used for Cook Inlet sampling. To provide more time for data synthesis and operate within the proposed budget, we will not sample quarterly transect lines in lower Cook Inlet in years 4 and 5.

Water samples will be collected at a subset of stations along each CTD transect for phytoplankton and nutrient analyses, and vertical plankton net tows will be conducted for zooplankton (to be analyzed by Rob Campbell at PWSSC – see separate project). This sampling and collaboration with PWSSC will allow us to make a cost-effective assessment of lower trophic levels and compare to patterns observed in PWS (Campbell proposal) and the outer Kenai coast (Hopcroft proposal).

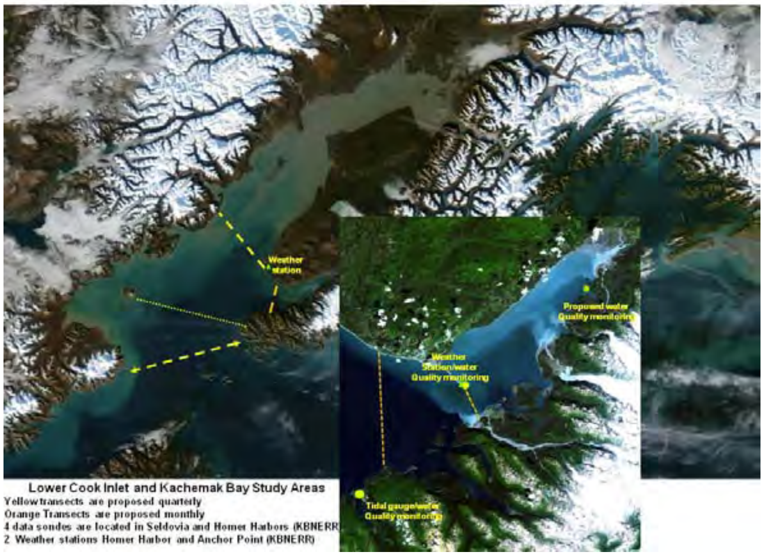


Figure 5. Proposed oceanographic monitoring locations in Kachemak Bay and lower Cook Inlet

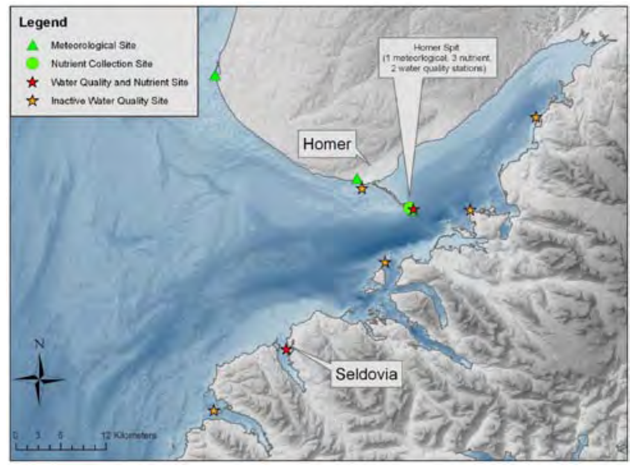


Figure 6. Locations of meteorological (green triangles) water quality (red stars) nutrient (green circles) and historic water quality stations (orange stars) within Kachemak Bay, Alaska.

Proposal synopsis: The Seward Line: Marine Ecosystem monitoring in the Northern Gulf of Alaska

Russell R Hopcroft, Principal Investigator (hopcroft@ims.uaf.edu)

Justification

Long times-series are required for scientists to tease out pattern (and cause) from simple year-to-year variability. Like other regions, the Northern Pacific undergoes significant inter-annual variability, driven partially by variations in major climatic indices (e.g. El Niños, the Pacific Decadal Oscillation). Larger longer-term variations referred to as "regime shifts" have occurred in the past, and will likely occur again. Regime shifts are expressed as fundamental shifts in ecosystem structure and function, such as the 1976 regime shift that resulted in a switch within the Gulf of Alaska from a shrimp-dominated fishery to one dominated by pollock, salmon and halibut. Given the potential for such profound climatic impact, the Seward Line Long-term Observation Program (http://www.sfos.uaf.edu/sewardline/) provides these critical observations on the current state of the Northern Gulf of Alaska ecosystem.

The Seward Line represents the most comprehensive long-term multidisciplinary sampling program in the Coastal Gulf of Alaska that allows observation of changes in the oceanography of this region that is critical to Alaska's fisheries, subsistence and tourist economies. Seward Line observations over the past 13 years have fundamentally revised our understanding of the coastal Gulf of Alaska ecosystem and allow us an appreciation of not only its major properties, but also their inter-annual variability. To date, we have observed both unusually warm and cold years, which influence the timing of the planktonic communities, but not necessarily their ultimate abundance and biomass. The quantity and composition of both late spring and summer zooplankton, appear to be significantly correlated with PWS hatchery Pink Salmon survival in this region; relationships to herring have yet to be explored. Thus, springtime abundance of zooplankton along the Seward Line appears to be an index of generally favorable years for higher trophic levels throughout the Gulf of Alaska. The larger GOA-IERP program, which the Seward Line provides an oceanographic foundation for, will explore broader regional patterns as well as look for relationships between oceanography and other species of forage and commercial fish.

Project Objectives:

The scientific purpose of this project is to develop an understanding of the response of this marine ecosystem to climate variability, and provide baselines against which to access any other anthropogenic influences on the GOA ecosystem. Toward this end, the Seward Line cruises on the Gulf of Alaska shelf determine the physical-chemical structure, primary production and the distribution and abundance of zooplankton, along with their seasonal and inter-annual variations. Some of the data is compared with historical data sets whereas other data sets are a product of this continuing systematic sampling effort on this shelf.

Specifically, cruises:

1. Determine thermohaline, velocity, and nutrient structure of the Gulf of Alaska shelf, emphasizing the Seward Line, and Prince William Sound stations (Figure 1).
2. Determine the state of carbonate chemistry (i.e. Ocean acidification)
3. Determine primary production and phytoplankton biomass distribution.
4. Determine the distribution and abundance of zooplankton.

5. Determine rates of growth and egg production of selected key zooplankton species.

Project Integration

This project links tightly with the GAK1 mooring, providing a cross shelf context for its observations. It complements the CPR, PWS, and Lower Cook Inlet/Kachemak Bay long-term monitoring efforts by providing more detailed oceanographic evaluation of the GOA shelf and the major passages in PWS than provided by the other programs. All of these components overlap in their sampling locations relatively little, enough to ensure comparability between datasets, but not enough to be duplicative. The Seward Line cruises are timed to capture the 2 dominate states of this ecosystem at high resolution: the spring bloom and the more oligotrophic summer. Notably, the Seward Line cruises have been monitoring Montague Strait, as requested by the RFP, since its inception.

Leveraging

This proposal seeks for EVOS to join the consortium of NPRB, AOOS and NOAA currently funding the line. We propose to add additional sampling (the central sound and Hinchinbrook Entrance) to provide more extensive representation of PWS. Full annual costs are ~400K including ship time, thus the 4 members of the consortium should each contribute ~100K per year. Some cost saving are anticipated in 2013 when NPRB's GOA-IERP program will cover a larger than normal share of the annual funding and provide larger sampling context throughout the Gulf of Alaska Shelf. The proposal also leverages on the consolidation of historical and contemporary information in the Gulf of Alaska planned through GOA-IERP program.

Project Approach and Logistics

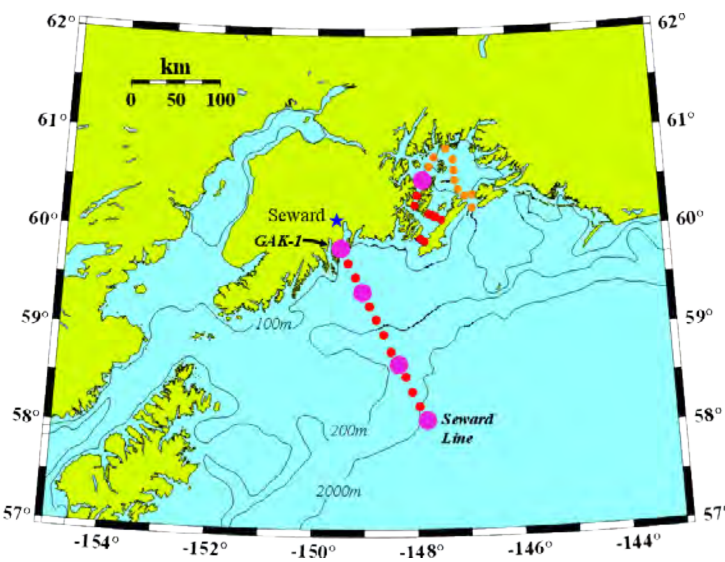


Figure 7. LTOP stations. In addition basic sampling, purple stations have primary production and zooplankton growth or reproduction incubations. Orange stations will be added, some with historical

The Seward Line (Figure 7) is a transect of 21 stations stretching from GAK1 at the mouth of Resurrection Bay (Seward, Alaska) southward approximately 150 miles to beyond the continental shelf, augmented by 11 stations in Prince William Sound. From 1998-2004, cruises occurred 6-7 times annually. From 2005 onward the program consists of two cruises each year, in early May and early September, to capture the typical spring bloom and stabilized summer conditions, respectively. Using the USFWS vessel *Tiglax*, we determine the physical-chemical structure, algal biomass, primary (algal) production, and the distribution, abundance, biomass and productivity of zooplankton (using 2 different net types). We explore seasonal and inter-annual variations, seeking to understand how different climatic conditions influence the biological conditions in each of these years. Since in 2007 we have also monitored carbonate chemistry (i.e. ocean acidity). If funded by EVOS, we propose routine sampling at an additional 5-9 stations in the northern and eastern PWS sampled intermittently over the duration of the Seward Line program.

Patterns emerging from the time series and results from each cruise are posted online at http://www.sfos.uaf.edu/sewardline/ as they become available.

Proposal synopsis: Long-term Monitoring of Oceanographic Conditions in the Alaska Coastal Current from Hydrographic Station GAK 1.
Thomas Weingartner, Principal Investigator, (weingart@ims.uaf.edu)

Justification
The purpose of this proposal is to provide long-term monitoring data on the physical oceanography of the Alaska Coastal Current and the northern GoA shelf. The Alaska Coastal Current (ACC) is the most prominent feature of the Gulf of Alaska's shelf circulation. It is a narrow (~40 km), swift, year-round flow maintained by the integrated forcing of winds and coastal freshwater discharge. That forcing is variable and reflected in ACC properties. The current originates on the British Columbian shelf and leaves the Gulf for the Bering Sea through Unimak Pass. Substantial portions of the ACC circulate through Prince William Sound and feed lower Cook Inlet and Kachemak Bay before flowing southwestward through Shelikof Strait. The current controls water exchange and transmits its properties into the fjords and bays between Prince William Sound and the Alaskan Peninsula. The monitoring proposed herein quantifies variability of the Gulf's shelf environment. ACC monitoring provides the broader-scale context for understanding variability in adjacent marine ecosystems and its affect on particular species (e.g., herring, salmon, forage fish). The ACC's variability is transmitted to nearshore habitats around the gulf.

Measurements at GAK 1 (Figure 4), at the mouth of Resurrection Bay, began in 1970. Initially the sampling was opportunistic, became more regular in the 1980s and 1990s, and systematic beginning in 1997 with EVOSTC support. Since then it involves involves monthly conductivity-temperature versus depth (CTD) casts and hourly temperature and salinity measurements at 6 depths distributed over the water column. GAK 1 is *the only station* in the GoA that measures both salinity and temperature over the 250 m deep water column.

The 40-year GAK 1 time series has documented:

1. The large interannual differences associated with El Nino and La Nina events, including substantial differences in the spring bloom between these phenomena (Weingartner et al., 2003, Childers et al., 2005).
2. The intimate connection between coastal freshwater discharge and the depth-varying evolution of winter and spring temperatures over the shelf (Janout et al., 2010; Janout 2009).
3. That GAK 1 is a reliable index of ACC transports of mass, heat, and freshwater (Weingartner et al., 2005).
4. That GAK 1 near-surface salinities are correlated with coastal freshwater discharge from around the Gulf (Weingartner et al., 2005).
5. Variations in mixed-layer depth in the northern Gulf, which affects primary production (Sakar et al., 2006)
6. Decadal scale trends in salinity and temperature, (Royer, 2005; Royer and Grosch, 2006; Weingartner et al., 2005, and Janout et al., 2010).
7. The relationships between temperature and salinity variations and the Pacific Decadal Oscillation and the strength and position of the Aleutian Low (Royer, 2005; Weingartner et al., 2005, and Janout et al., 2010)
8. That the record can guide understanding the variability in iron concentrations, a potentially limiting micro-nutrient required by many phytoplankton. Preliminary efforts indicate that iron and surface salinity are correlated at least in certain seasons (Wu, et al., 2008).

As shown by Meuter et al., (1994), Meuter (2004), and Spies (2009), these issues affect ecosystem processes on both the shelf and within Prince William Sound and Lower Cook Inlet/Kachemak Bay.

Project Objectives:

The fundamental goal of this program is to provide a high quality, long-term data to quantify and understand monthly, seasonal, interannual and longer period variability of the GoA shelf. This measurement provides the broader scale spatial perspective discussed on pages 1 -5. Specifically we will measure:

1. Temperature and salinity throughout the water column,
2. Near surface stratification since this affects phytoplankton bloom dynamics,
3. Near and subsurface nitrate supply on the inner shelf, since this important nutrient affects phytoplankton production,

Project Integration

Integration with other PIs and components of the monitoring, herring and lingering oil efforts were outlined on pages 1 – 5. In addition, we note that the GAK 1 effort has assisted others with their research. For example, in 2001-02 it provided a test bed for prototype halibut tags (developed by USGS-BRD scientists), which were then used to study halibut migrations in the GoA and Bering Sea. The data are being used by herring biologists to assess energetic costs of overwintering herring (Heintz, pers. comm), and it has been used studies of king crab (Bechtol, 2009), spiny dogfish Tribuzio (2009), the community structure of rocky coasts (Ingolfsson, 2005), and salmon (Boldt and Haldorson, 2002). We have recently had requests from Steve Moffit (ADF&G salmon biologist) to use this data as an aid in salmon forecasts and we are aware of several Gulf fishermen who routinely access this data set. After processing, the data will be posted to the GAK 1 website (http://www.ims.uaf.edu/gak1/) and submitted to the data management team for archiving.

Leveraging

We are collaborating at no cost to this proposal with National Park Service scientists at Glacier Bay who are sampling in Glacier Bay using CTD sampling and analysis protocols identical to those at GAK 1. Since southeast Alaska waters contribute to the ACC, the 15 year Glacier Bay time series provides the opportunity to assess variability in the northeast and northwest Gulf and to understand how these regions co-vary and how the ACC evolves as if flows westward toward Prince William Sound. The GAK 1 mooring includes a nitrate sensor that was provided by the Alaska Ocean Observing System (AOOS) to this project.

Project Approach and Logistics

The GAK 1 sampling approach will be identical to that supported by EVOSTC in the recent past: monthly CTDs and maintenance of the year-round oceanographic mooring. Sampling is cost-effectively serviced from Seward using local charters or small boats operated by the Seward Marine Center.

LONG-TERM MONITORING: NEARSHORE BENTHIC ECOSYSTEMS IN THE GULF OF ALASKA

Principal Investigators:

Brenda Ballachey
USGS Alaska Science Center
4210 University Drive
Anchorage, AK 99508

Thomas Dean
Coastal Resources Associates, Inc.
5190 El Arbol Drive
Carlsbad, CA 92008

Heather Coletti
Southwest Alaska Inventory & Monitoring Network
National Park Service
240 W. 5th Avenue
Anchorage, AK 99501

Brenda Konar and Katrin Iken
School of Fisheries and Ocean Sciences
University of Alaska Fairbanks
P.O. Box 757220
Fairbanks, AK 99775

Collaborators:

Kim Kloecker
USGS Alaska Science Center
4210 University Drive
Anchorage, AK 99508

Michael Shephard
Southwest Alaska Inventory & Monitoring Network
National Park Service
240 W. 5th Avenue
Anchorage, AK 99501

Angela Doroff
Kachemak Bay Research Reserve
95 Sterling Highway, Suite 2
Homer, AK 99603

Mandy Lindeberg
NOAA/NMFS Auke Bay Laboratory
11305 Glacier Hwy
Juneau, AK 99801

Introduction:

The nearshore is considered an important component of the Gulf of Alaska ecosystem, including the region affected by the *Exxon Valdez* oil spill (EVOS), because it provides:

- A variety of unique habitats for resident organisms (e.g. sea otters, harbor seals, shorebirds, seabirds, nearshore fishes, kelps, seagrasses, clams, mussels, and sea stars).
- Nursery grounds for marine animals from other habitats (e.g. crabs, salmon, herring, and seabirds).
- Feeding grounds for important consumers, including killer whales, harbor seals, sea otters, sea lions, sea ducks, shore birds and many fish and shellfish.
- A source of animals important to commercial and subsistence harvests (e.g. marine mammals, fishes, crabs, mussels, clams, chitons, and octopus).
- An important site of recreational activities including fishing, boating, camping, and nature viewing.
- A source of primary production for export to adjacent habitats (primarily by kelps, other seaweeds, and eelgrass).
- An important triple interface between air, land and sea that provides linkages for transfer of water, nutrients, and species between watersheds and offshore habitats.

Also, the nearshore is broadly recognized as highly susceptible and sensitive to both natural and human disturbances on a variety of temporal and spatial scales. For example, observed changes in nearshore systems have been attributed to such diverse causes as global climate change (e.g. Barry et al. 1995, Sagarin et al. 1999), oil spills (e.g. Dahlmann et al. 1994 Peterson et al. 2001, 2003), human disturbance and removals (e.g. Shiel and Taylor 1999, Murray et al. 1999), and influences of invasive species (e.g. Jamieson et al. 1998). Nearshore systems are especially good indicators of change because organisms in the nearshore are relatively sedentary, accessible, and manipulable (e.g. Dayton 1971, Sousa 1979, Peterson 1993, Lewis 1996). Also, in contrast to other marine habitats, there is a comparatively thorough understanding of mechanistic links between species and their physical environment (e.g. Connell 1972, Paine 1977, 1994, Estes and Duggins 1995) that facilitates understanding causes for change.

Perhaps most important with respect to the goals of the proposed Long-Term Monitoring program, the nearshore is the one habitat within which it is most likely that we will be able to detect relatively localized sources of change, tease apart human-induced from natural changes, and provide suggestions for policies to reduce human impacts. Because many of the organisms in the nearshore are sessile or have relatively limited home ranges, they can be geographically linked to sources of change with a reasonable degree of accuracy.

Finally, the nearshore is critically important because it was without doubt the habitat most impacted by the 1989 EVOS, and as of 2002, was known to be a persistent repository for oil that could be linked to continued injury to species that reside there (especially, sea otters, and harlequin ducks; Peterson et al. 2003, Short et al. 2004). In addition, the majority of the species or services currently listed by the EVOS Trustee Council as either "not recovered" or "status of recovery unknown" reside in or are associated with the nearshore. Thus, monitoring within the nearshore system provides the opportunity to continue to assess progress toward recovery, and to hasten that recovery by identifying and ameliorating other human induced disturbances.

Following several years of planning, a restoration and ecosystem monitoring plan for the nearshore marine ecosystems affected by the EVOS in the Gulf of Alaska (GOA) was completed (Dean and Bodkin 2006). Within this plan it was recognized that (1) restoration of resources injured by the spill will benefit from information on the status and trends of those resources on a variety of spatial scales within the Gulf, and (2) causes of changes independent of the oil spill are likely to occur in the GOA during the 21st century, and are likely to result from a number of different agents (e.g. normal environmental drivers, global climate change, shoreline development and associated inputs of pollutants). Further, in order to effect restoration of injured resources it is essential to separate EVOS-related effects from other sources of change. It was also recognized that changes are likely to occur over varying temporal and spatial scales. For example, global climate change may result in a gradual change in the nearshore community that occurs over decades and has impacts over the entire GOA. On the other hand, impacts from shoreline development will likely be more episodic and more local. Thus, one challenge of designing a monitoring program was to detect changes occurring over widely varying scales of space and time, and from various causes. To this end, a conceptual framework for monitoring was designed with the following elements:

1) Synoptic sampling of specified physical and biological parameters (e.g. shoreline geomorphology and eelgrass cover) over the entire GOA.
2) Sampling of a variety of specified biological and physical parameters (e.g. abundance and growth of intertidal organisms, abundance of selected birds and marine mammals) within a few specified areas spread throughout the GOA; these are referred to as intensive sites. The focus is on species injured by the EVOS, in particular species not recovered or whose status relative to recovery is uncertain.
3) Sampling of a smaller suite of selected biological and physical parameters (e.g. the abundance, growth, and contaminant levels in mussels and clams) at a larger number of less intensively studied sites stretching across the GOA. These are referred to as extensive sites.
4) Conduct of shorter-term studies aimed at identifying important processes regulating or causing changes within a given system or subsystem.

Intensive sampling was designed to detect larger spatial scale changes while extensive sampling was aimed at evaluating potential impacts from more localized sources, and especially those resulting from human activities. Process studies were to focus on determining causes for observed changes.

The monitoring plan developed for the EVOSTC was revised and adopted by the National Park Service's Vital Signs Long-Term Monitoring Plan, and implemented in Katmai NP in 2006 and in Kenai Fjords NP in 2007. In 2010, we (EVOS Project 10100750; Bodkin and Dean) were funded through the EVOSTC to implement the long-term nearshore monitoring plan in western Prince William Sound (PWS), providing for monitoring of the nearshore environment, sea otters, nearshore sea birds (including black oystercatchers), and intertidal kelps, seagrasses and invertebrates.

Project Concept:

We now propose to continue a long-term restoration and ecosystem monitoring program at four locations across the GOA. Most of the effort to be funded by the EVOSTC program is concentrated on PWS, but we plan to integrate with existing monitoring efforts to cost-effectively monitor other areas of the spill affected region and provide better information for recovery and restoration of injured resources. The proposed sampling design follows that initially put forward in 2006, and modified in 2010. It consists of four primary sampling locations in nearshore habitats in the central GOA region between Katmai and PWS (Figure 1) and includes four regions, PWS, Kenai and Katmai National Parks, and Kachemak Bay. Within PWS, we propose to (1) continue sampling the western block on an annual basis through 2016 (western PWS was already sampled in 2007 and 2010, with planned sampling in 2011 and 2012 under EVOS Project 10100750), and (2) add locations in eastern and northern PWS, to be sampled biennially through 2016. We also propose to implement the monitoring program in Kachemak Bay, an area that already has been the focus of long-term intertidal monitoring (Konar and Iken, UAF), and where existing monitoring protocols will be adapted to be consistent with those used in the other study areas, providing comparable data. Monitoring includes physical measurements, kelps and sea grasses, marine invertebrates, birds, and mammals, with a focus on species that were injured as a result of the EVOS. In addition to taxa specific resources, monitoring includes recognized important ecological relations that include well described predator-prey relations, measures of nearshore ecosystem productivity, and stable isotope and contaminant analyses. The benthic monitoring program will also rely on physical data collected in PWS, along the GOA shelf and in Cook Inlet, under the Environmental Drivers component of the proposed long-term monitoring program.

Locations (see Figure 1)**:**
Western PWS (5 intensive sites): This study area is already funded by EVOSTC (Project 10100750), covering data collection during 2010-2012. We are requesting funds to continue monitoring the study sites long-term, including 2013–2016.

Eastern and Northern PWS: These study areas were initially proposed as part of the long-term monitoring plan developed for PWS in 2006; however, they have not been incorporated into the ongoing study. We request funds to initiate sampling at 5 sites in each area (northern and eastern PWS), to be sampled alternate years, starting in 2012.

Katmai and Kenai National Parks (5 intensive sites each park): These study areas have been funded primarily by NPS, with data collection at Katmai ongoing since 2006, and at Kenai ongoing since 2007. We request funding for support of sea otter aerial surveys at both areas (alternate years each location), for the charter vessel to Katmai for annual sampling, and for support of personnel who will be involved in data collection and management across all study locations, 2012-2016.

Kachemak Bay (5 intensive sites): Monitoring of intertidal invertebrates and algae in nearshore areas of Kachemak Bay has been ongoing for over a decade, along with extensive sea otter studies shellfish surveys, and oceanographic measurements. Intertidal survey methods have followed slightly different protocols from those used in the other proposed nearshore study areas.

We request funds to support the implementation of sampling protocols that will be consistent with other areas, 2012-2016.

Objectives

1. Continue restoration monitoring in the nearshore in order to evaluate the current status of injured resources in oiled areas.
2. Identify if those injured resources being monitored may be considered recovered from EVOS effects.
3. Identify potential factors that could inhibit recovery of injured resources, and recommend potential restoration actions.

Tasks

The projected schedule of tasks for the nearshore benthic component is outlined in Table 1.

1. Collection of sea otter skulls for determination of age-at-death.
Surveys will be conducted in PWS in April of each year to collect sea otter carcasses for determination of age-at-death to be used in describing annual survival. In Katmai and Kenai, surveys for carcasses will be conducted opportunistically during the June/July field work. In Kachemak Bay, a coalition of the Center for Alaska Coastal Studies, the Homer Marine Mammal Stranding Network, and the USFWS have been and will continue to conduct systematic beach walks to recover dead birds, sea otters, and marine debris.

2. Annual collection of sea otter diet data.
Data will be obtained through direct observation of foraging sea otters using high powered spotting scopes and a stratified random sampling design.

3. Aerial surveys of sea otter abundance.
Estimates of sea otter abundance (variance) and distribution will be obtained through detection corrected standardized aerial surveys using a stratified random sampling design.

4. Sampling of intertidal invertebrates and algae.
Estimates of the abundance and sizes of intertidal algae and invertebrates will be obtained from annual sampling along permanent transects and quadrats (5 sites per block, with both a rocky and a soft sediment transect at each site) using a stratified random sampling design. Sampling will include mussel collection for stable isotope analyses.

5. Sampling of sea grasses and subtidal kelps.
Estimates of seagrass and canopy-forming kelp abundance will be obtained through at sea surveys conducted in close proximity to each of the 5 sites per block.

6. Diet and productivity of black oystercatchers.
Black oystercatcher nests on transects associated with each of the intensive sites will be monitored annually in June/July for productivity, and shell litter will be collected to determine diet (prey items and sizes). Note: we will explore the potential for partnering with the USFS on black oystercatcher work already ongoing in PWS.

Standard operating procedures (SOP's) for all data collection have been fully developed as part of the preparation and implementation of nearshore monitoring in Katmai NP, Kenai NP, and western PWS. The *Nearshore Restoration and Ecosystem Monitoring Program* (Dean and Bodkin 2006) and the *National Park Service SWAN Nearshore Monitoring Program* (Dean and Bodkin 2011) include protocols that provide justification, background, objectives, goals, an overview of the monitoring and sample design, the fundamental analytical approach, and description of operational requirements. The SOP's provide the details of each data collection procedure, their relations to one another, and how they can be integrated to provide understanding of causes of change that will be detected.

Data analyses and statistical methods used to evaluate changes in the nearshore environment are detailed in Dean and Bodkin (2006) and Dean et al. (2008). In general we will examine trends in each metric over time within each location, differences between locations over time, and interactions between time and locations (i.e., the extent to which changes within each location track changes across locations over time) through regression and information-theoretic (IT) criteria (Burnham and Anderson 2002, 2004). Competing hypotheses (models) will be selected a priori and those models will be ranked based on their relative support (AIC values). These analyses will help to sort out effects of small scale sources of change (e.g.„effects of oil in PWS or other location specific impacts such as logging activities) from larger scale sources of change (e.g., those due to climate change that are occurring over the entire GOA).

Project Logistics

Task 1 will be accomplished in PWS by a 6 d research cruise in April of each year, and in Katmai and Kenai NPs during the June/July field trips. Tasks 2, 4, and 5 will be accomplished during a single 9-10 d cruise in June/July of each year. Task 3 will be accomplished by single engine aircraft during the summer months. Task 6 will be accomplished through additional samplings in 2012 & 2013 (harlequin ducks already being sampled in 2011). Work will be coordinated and integrated with the NPS Southwest Alaska Network (SWAN) long-term nearshore monitoring at Kenai Fjords and Katmai National Parks.

Study Team:

The team of scientists working on this project have an extensive background of research efforts in coastal marine areas of Alaska. B. Ballachey and T. Dean have both been Principal Investigators on previous EVOS studies, with a primary focus on PWS studies, since 1989, and currently are conducting the monitoring of nearshore areas in PWS. T. Dean has been central in development and implementation of both the NPS and the USGS/EVOS nearshore monitoring programs. M. Shephard of the NPS is in charge of the long-term monitoring program in the Kenai and Katmai parks; H. Coletti has worked in the GOA since 2000, and has been dedicated to the NPS nearshore monitoring program since 2008. B. Konar and K. Iken both have extensive experience working in various coastal areas of Alaska, and are currently conducting the nearshore monitoring in Kachemak Bay. Overall project management will be the responsibility of Ballachey, Dean, Coletti, Konar and Iken. We anticipate that Dean, Ballachey and Coletti, with support from M. Lindeberg, K. Kloecker, M. Shephard and additional USGS and NPS scientific staff, will continue the data collection and sampling (all components) in PWS, Kenai and Katmai, and that B. Konar and K. Iken will have responsibility for the Kachemak Bay site, with support from A. Doroff for sea otter foraging observations and additional support from the USFWS for sea otter surveys and carcass collections. Further, we anticipate a team approach to the overall field work effort, with shared personnel across areas wherever possible, to ensure consistency of data collection and enhance our understanding of comparisons and contrasts across areas. We will attend an annual meeting of the larger group of scientists involved in the overall long-term monitoring; but also expect that we will continue to work closely together as a sub-group and to meet less formally as required throughout each year.

Linkages:

A primary goal of the proposed monitoring effort is to evaluate the recovery status of resources in PWS that were injured by the EVOS. Our ability to assess the restoration of resources injured by the spill will benefit from information on the status and trends of those resources on a variety of spatial scales within the Gulf. We will continue evaluation of EVOS injured resources and services (recreational, subsistence, and passive use), to determine when populations may be considered recovered, and where applicable, to foster recovery of those resources by identifying and recommending actions in response to factors limiting recovery. The NPS program for nearshore monitoring along the Katmai, Kenai Fjords, and Lake Clark National Park coasts was initiated in 2006, and has been collecting information similar to the data sets that have been used to assess recovery of injured resources in PWS (e.g., population abundance and survival of sea otters, population abundance of harlequin ducks and other nearshore birds, abundance estimates for mussels, clams, and other intertidal organisms). The addition of the study area in Kachmak Bay (where monitoring has been ongoing for approximately a decade, although methods have varied from those used in PWS) will further enhance our ability to assess recovery. Contrasts among trends in injured resources in and outside Prince William Sound, including both oiled and unoiled areas, will provide the primary means of resource evaluation. We will also integrate data on injured resources collected as part of this effort with data on (1) locations of persistent EVOS oil along shorelines, and (2) biomarker expression in harlequin ducks and sea otters as an indicator of continuing exposure to residual oil, anticipated as part of the Lingering Oil component of this project.

Sea otters are a focus species for restoration monitoring, as the population in western PWS was severely impacted by the EVOS, and in areas where shorelines were most heavily oiled, sea otters have not recovered to pre-spill abundance (Bodkin et al. 2002, Monson et al. 2000). Data to be collected as part of the proposed monitoring will contribute to existing long-term data sets from WPWS and other regions, including survey data on sea otter abundance since 1993, carcass data on sea otter ages at death, since 1976, and sea otter foraging data since the mid-1970s.

As productivity in the nearshore is strongly influenced by physical oceanographic processes, it will be a priority to evaluate whether or not changes that may be noted in the nearshore systems are reflected in either oceanographic conditions or in synchronous changes in pelagic species and conditions. The geographic scale of our study (GOA-wide) will provide greater ability to discern both potential linkages across these diverse components, as well as among the study areas within the nearshore, allowing us to evaluate relations and changes in the nearshore resources. We will incorporate data on annual and seasonal patterns measured in the Environmental Drivers component of the overall study as well as data from the Pelagic study components. One component of the overall LTM of particular importance to the nearshore is surveys of nearshore marine birds, which will be accomplished in PWS through the Marine Bird Population Trends monitoring component (representing a further long-term data set; see Irons et al. 2000) and at Kenai Fjords and Katmai by the NPS SWAN program.

Five Year Goals:

At the end of the first five years of studies, we plan to answer a number of questions, including: Are there changes in the nearshore communities monitored in our study? Are any observed changes in the nearshore synchronous across the GOA? Are changes reflected in concurrent changes in oceanographic or pelagic conditions? Have injured resources in the nearshore recovered from the spill? If not, are there other factors (non-spill related) constraining their recovery?

Data synthesis within the nearshore group, and sharing, integration and synthesis across the larger Long-term Monitoring group, will be a priority. This process will be advanced to a great extent by annual meetings of the project scientists.

By the 4th year, we plan to have completed a power analysis to optimize sampling (this analysis will be initiated in 2011, using data collected over five years from the Katmai NP study area). We will identify those metrics showing greatest variation among areas or change over time, and consider the development of process studies as appropriate to understand the causes of variation.

We will make a concerted effort to participate in outreach activities, to disseminate our key findings to a greater group of stakeholders with interest in the GOA study areas.

Table 1. Components of the proposed nearshore benthic monitoring plan and five year schedule.

COMPONENT	2012	2013	2014	2015	2016
Western PWS, intertidal invertebrates and algae	x	x	x	x	x
Western PWS, kelps and sea grass	x	x	x	x	x
Western PWS, black oystercatchers	x	x	x	x	x
Western PWS, contaminants	x				
Western PWS, sea otter carcass recovery	x	x	x	x	x
Western PWS, sea otter foraging observations	x	x	x	x	x
Eastern PWS, intertidal invertebrates and algae	x		x		x
Eastern PWS, kelps and sea grass	x		x		x
Northern PWS, intertidal invertebrates and algae		x		x	
Northern PWS, kelps and sea grass		x		x	
Katmai NP, intertidal invertebrates and algae	x	x	x	x	x
Katmai NP, kelps and sea grass	x	x	x	x	x
Katmai NP, black oystercatchers	x	x	x	x	x
Katmai NP, sea otter carcass recovery	x	x	x	x	x
Katmai NP, sea otter foraging observations	x	x	x	x	x
Kenai NP, intertidal invertebrates and algae	x	x	x	x	x
Kenai NP, kelps and sea grass	x	x	x	x	x
Kenai NP, black oystercatchers	x	x	x	x	x
Kenai NP, sea otter carcass recovery	x	x	x	x	x
Kenai NP, sea otter foraging observations	x	x	x	x	x
Kachemak Bay, intertidal invertebrates and algae	x	x	x	x	x
Kachemak Bay, sea otter carcass recovery	x	x	x	x	x
Kachemak Bay, sea otter foraging observations	x	x	x	x	x
PWS, sea otter aerial survey	x		x		x
Kenai NP, sea otter aerial survey		x		x	
Katmai NP, sea otter aerial survey	x		x		x
Kachemak Bay, sea otter aerial survey	x		x		x
Copper River Delta, intertidal invertebrates	x		x		x
PWS Nearshore marine bird survey (under Pelagic component)	x		x		x
Katmai nearshore marine bird survey	x	x	x	x	x
Kenai nearshore marine bird survey	x	x	x	x	x
Stable isotope analysis of mussels (5 areas/yr)	x	x	x	x	x

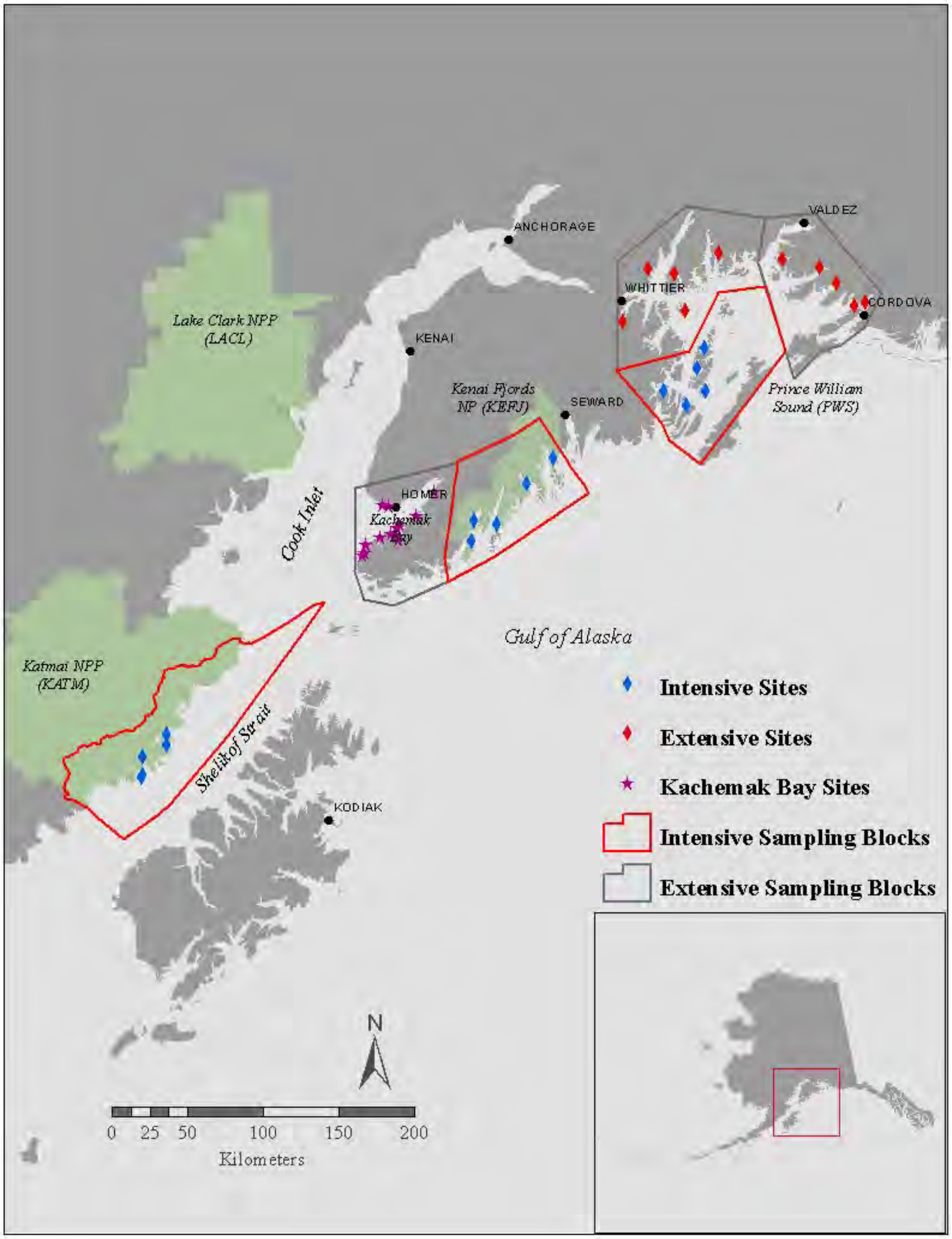


Figure 1. Sites currently part of (Katmai, Kenai, and WPWS; USGS/EVOSTC and NPS) and proposed (Kachemak Bay, NPWS, and EPWS) for long-term monitoring (LTM) under the LTM nearshore benthic component. Sites at Kachemak Bay/Kasitsna Bay have been monitored long-term (UAF) and will comprise an additional intensive block in the LTM nearshore benthic component; specific sites within the block to be included will be determined prior to 2012.

Long-term monitoring of Ecological Communities in Kachemak Bay: a comparison and control for Prince William Sound

Principal Investigators: Brenda Konar and Katrin Iken (UAF)

Co-operating Investigator: Angie Doroff (KBNERR)

Justification

Many protocol similarities exist between the monitoring that is currently being done in Prince William Sound (EVOSTC Project 10100750) and that which is being done in Kachemak Bay. By continuing this monitoring in both areas, comparisons can be made between the two regions and Kachemak Bay may be able to be used as a control for Prince William Sound if another spill were to occur. Historical data exist in both areas, making future comparisons of trends even more valuable.

Project Concept

This project will evaluate ecological communities in Kachemak Bay. Following protocols established for Prince William Sound, we will monitor sea otter abundance, diet and carcasses, seabird carcasses, marine debris, abundance and distribution of rocky intertidal plants and invertebrates, abundance and size frequency of clams and mussels on gravel beaches, and selected environmental parameters in Kachemak Bay. All protocols have been established and are described for Prince William Sound. These same protocols as will be used in this study. These Kachemak Bay data will be compared with those being collected in Prince William Sound and may be able to act as a control if an oil spill were to occur in the Sound again. The data will also be comparable to data being collected in Kenai and Katmai National Parks (National Park Service SWAN Nearshore Monitoring Program) using the same methods as used in Prince William Sound.

Objectives:

1) Determine trends in sea otter abundance.
2) Determine the diet and dietary shifts of sea otters.
3) Determine trends in sea otter and seabird mortality.
4) Determine trends in marine debris.
5) Determine trends in the abundance and distribution of rocky intertidal plants and invertebrates
6) Determine trends in the abundance and size frequency of clams and mussels on gravel beaches.
7) Determine trends in selected environmental parameters and relate them to #1-6 above.

The field work for this proposal will completed annually for four years and followed by a year of data synthesis (year 5), with the outlook of continuing this pattern of monitoring for up to 20 years.

Project Integration

We expect strong collaboration between all components of this project with the Prince William Sound, Katmai and Kenai components (all nearshore monitoring with similar data collection methods) and the Oceanographic component. Data sharing is integral to the success of this program. This project will be integrated with two University of Alaska field courses that are taught by Konar and Iken at the Kasitsna Bay Lab. Students will get valuable experience and training from participating in this project and the project will benefit from having these students.

Project Logistics

For this project, Brenda Konar and Katrin Iken will provide overall project management. They also will oversee the rocky intertidal and gravel beach portion of this study. This will include working with student field assistants, conducting the field work (including some collections of environmental parameters) and completing analyses. Angie Doroff will complete the sea otter foraging observations component of this project and will oversee some of the environmental parameter collections. The USFWS has tentatively committed to conducting sea otter abundance surveys (confirmation anticipated when 2011 federal budgets are determined). The Center for Alaska Coastal Studies, the Homer Marine Mammal Stranding Network, and the USFWS have been and will continue to conduct systematic beach walks to recover dead birds, sea otters, and marine debris.

The intertidal sampling effort in Kachemak Bay varied on both spatial and temporal scales (Table 1). Two different habitats were sampled, macroalgal covered rocky shores and seagrass beds (Figure 1). All data collected from Kachemak Bay have been shared with the Ocean Biogeographic Information System (OBIS, www.iobis.org) and are stored in a NaGISA/Census of Marine Life database.

Pelagic Monitoring Component:

Summary: Jeep Rice, National Marine Fisheries Service, Auke Bay Laboratory

This is a mixed species group (killer whales, humpback whales, forage fish, and sea birds) that is critical to understanding long term effects of the spill (injured species) as well as the status and energy flow through the ecosystem (top down apex predators, and bottom up prey species). Further, two of the longest term biological data sets, critical in the damage assessment process following EVOS as well as for long term population trends, reside in this group (killer whales and sea birds).

Retaining Long term biological data sets

Understanding natural changes through time or in response to man-caused events requires that we maintain our best long term biological population data sets, and to initiate new ones where we can. The killer whale population tracking dates back to 1985 and is one of the regions top population data sets as it tracks several pods down to the individual level (through photo-identification). The quality of this data set allowed the detection of a population effect to killer whales in post spill analyses even though carcasses were never found during the spill event. Because this population data set is at the individual level, critical life rates of recruitment and death can be monitored as well. As an injured species, this group will be tracked to confirm the recovery process over time for the AB pod, and the extinction process for the AT1 pod.

The sea bird population data set measures population trends, was also initiated prior to the spill, and monitors the recovery of population trends in injured species. With shorter life spans, this group is more sensitive to identifying changes in population trends over time, as this group is very responsive to changes in environmental conditions.

Understanding energy flow through the ecosystem

Understanding the status of an ecosystem in systems that are constantly changing is a daunting problem as all parts of the ecosystem cannot be monitored, and the parts that are monitored cannot be monitored continuously. Understanding energy flow through the system, coupled with population trends, offers the best approach. The Pelagic Monitoring projects will track both predators (killer whales, humpback whales, sea birds) as well as a major effort on forage fish (includes Eupahusiids), and will complement studies of the other major prey group (herring) undertaken in the separate Herring program. The forage fish species complex (including capelin, sand lance, eulachon , euphausiids, plus herring) are the major conduit of energy up to apex predators and sea birds. Forage fish species tend to fluctuate widely in recruitment processes and population levels, and have major impacts on the population stability of the predators.

Integration

There are multiple levels of integration within the complex of studies proposed in this group. The long term population monitoring integrates over time, starting prior to the spill, and we propose to extend these data sets out for the immediate 5 year period. The monitoring of top down forcing by whales and sea birds, the largest predators on herring, will complement the suite of herring studies, including insertion of key data into the population modeling of herring that will be used to manage herring in the future. The forage fish population studies, which have some supplemental process studies to complement the population monitoring, are primarily linked with the environmental drivers component of the larger monitoring program. Unfortunately, the forage fish species are also the most understudied group. They were not identified as an injured species (no studies were directed at this species group in response to the spill), and they are not part of a commercial fishery (so there are no long term data sets). Their value is their contribution to the ecosystem and on upper trophic level injured resources. In the case of sea birds, their numbers in response to prey will also be monitored by putting observers on whale and herring boats, ensuring integration with those studies.

Short species group descriptions

Killer whales: This study will continue the long term population monitoring of killer whale pods in PWS that was started by Matkin in 1985. This is the highest quality data set because it uses photo-identification of individuals, which then allows for calculation of critical life rates (recruitment, death), as well as biological information or maternal/calf relationships. This high quality data set allowed the detection of injured species at the population level (40% of the two pods were lost in the post spill years). Slow recovery is underway for AB pod; extinction is in progress for AT 1 pod. The extinction of AT 1 pod should have a positive impact on smaller marine mammal populations within PWS, at least until another marine mammal eating pod extends its foraging territory into the Sound. As APEX predators of fish and marine mammals, these two pods significantly affect the upper trophic dynamics of the sound.

Humpback whales: While this species was not identified as an injured species following the spill, it has been identified as a major predator on herring and a factor that is likely currently limiting the recovery of herring (instead of the bottom up forces limiting herring population). Humpback whales are currently listed as endangered or threatened, although the north Pacific population is rebounding well since whaling was stopped several decades ago. This population is currently doubling every 15-18 years, hence the problem on herring when whales focus on herring. Recent studies initiated 5 years ago have determined the predation of humpback whales on herring is greatest in PWS (compared to Sitka and Lynn Canal herring stocks), and varies by season and year. This study will continue the recently establish population monitoring for PWS, with a focus on identifying individual whales and quantifying the predation rates on herring. This study strongly supports the suite of herring studies proposed by Pegau et al, and data from this study will likely influence the herring modeling that will be used to manage herring in the future. As humpback whales are the most important predator on herring, affecting both herring numbers and school behavior, this study needs to be relatively intense in the first 5 year cycle, but can likely be conducted at a less frequent intervals in outlying cycles.

Forage fish: Forage fish (including euphausiids), are important to the energy flow up to predators. But because they are not a commercial species with a history of harvest information (like herring), there is no population base from which to expand. This species group has long been noted as an important component of the ecosystem food web, critical to other species, but we lack information on biology and population levels. There are several species of interest: capelin, eulachon, sand lance, and euphausiids, each with some overlap in niche but distinctly different in biology, timing, behavior, geography, and significance to other species. These complexities, along with the lack of a long term history of study at the population level requires an effort to “invent” the wheel, by establishing sampling protocols that can be repeated as a monitoring tool in the future. As a platform of opportunity, this study will need a greater investment in secondary observations (local basic oceanography at the time of collection, chemical determination of body condition and trophic status; observation of predators on schools). Combined with the suite of herring studies, the forage fish monitoring will be a very valuable study to assess energy flow up through the pelagic system.

Sea birds

Two primary bird studies are proposed: One is the Irons study for long term monitoring of population levels, initiated prior to the spill and conducted through the spill years; and the second is the Bishop study which used whale and herring vessels as observing platforms and integrates the bird observations with those studies.

The Irons study identified injured species during the spill, and has the best population data for birds, and continuation of this data set will allow tracking of the injured species as well as tracking the response of sea birds to the continue change from year to year. As environmental changes occur, different species will likely respond in different locations differently (winners and losers). This study offers the most sensitive vehicle to track biological response to environmental change over time.

The Bishop study is more integrated with two species groups- whales, and herring, and offers the advantage of low cost as the platforms for observation are coming from either the whale or herring studies. This study provides a quantitative assessment of numbers and species working on the herring resource, hence it is valuable to the suite of herring studies.

5- Year goals of the Pelagic group

There are two primary research goals for the pelagic team: Population monitoring of key species groups, and understanding the energy flow through the pelagic ecosystem with key measurements.

Long term monitoring of population trends to support restoration and management is the primary goal of the pelagic group. This is best done by first maintaining two important long term data sets established prior to the spill (killer whales [Matkin project], sea bird boat surveys [Irons project]). Both data sets were instrumental in understanding natural versus human caused changes. In addition, the recently initiated humpback whale foraging population study in PWS [Moran project] will be continued, primarily to provide input to the herring population modeling effort for management needs. The proposed humpback whale effort will be intense in the first 5 year cycle, but likely decline in frequency in outlying years. Lastly, a monitoring project for forage fish population trends will be initiated, with the aim of developing cost effective sampling methods and schemes. Forage fish, and herring, are a valuable conduit of energy to several species of predators (birds, fish, marine mammals), but can vary in number and recruitment between years and regions. While we understand their value, there is no history of long term monitoring for this species group. Understanding the contribution of forage fish (and herring) under different conditions (environmental drivers, predation) is essential to understanding how the ecosystem works and how energy flows though it.

Understanding energy flow through these pelagic groups will be monitored where possible as part of this monitoring program. Tracking energy flow will hopefully integrate information from "environmental drivers" to the species groups, and integrate with other key groups such as herring. Recruitment information will be gathered from both killer and humpback whales (calves can be identified with mothers). Condition and energy content will be measured in samples of forage fish (similar to the measurements in herring). Further, predation rates will be measured by the humpback whales and seabirds (Bishop project). The contributions from the proposed forage fish study (and herring program) may be the most informative, providing data on both population trends and energetics. It is expected that the true value of these studies will realized after several years, when a range of oceanic conditions have been observed, with varying biological responses, and the data are synthesized across time and species groups.

Long-term monitoring of seabird abundance and habitat associations during late fall and winter in Prince William Sound

Principal Investigator:

Mary Anne Bishop, Ph.D., Prince William Sound Science Center, Cordova

Collaborators:

Kathy Kuletz, Ph.D. US Fish & Wildlife Service, Migratory Bird Mgmt, Anchorage

John Moran, Auke Bay Lab, NOAA, Juneau

Michelle Buckhorn, Ph.D. & Richard Thorne, Ph.D. Prince William Sound Science Center, Cordova

Statement of the Problem

The vast majority of seabird monitoring in areas affected by the Exxon Valdez oil spill has taken place around breeding colonies during the reproductive season, a time when food is generally at its most plentiful. However, seabirds spend most of the year widely dispersed. At higher latitudes, late fall through winter are critical periods for survival as food tends to be relatively scarce or inaccessible, the climate more extreme, light levels reduced, day length shorter and water temperatures colder. Long-term monitoring of seabirds during winter is needed to understand how post-spill ecosystem recovery and changing physical and biological factors are affecting seabird abundance, species composition, as well as their distribution and habitat use in Prince William Sound.

Project Concept

Changes in the timing of biological events, geographic range and/or relative abundance of species, community structure, and system productivity can be indications of a changing ecosystem. For example, a recent 10-year monitoring effort along the transition zone between the California Current and the Gulf of Alaska documented significant increases in seabird species diversity and relative abundance during the nonbreeding season that corresponded with a possible regime shift to cooler conditions.

In December 2004, we began monitoring seabird abundance and distribution in Prince William Sound (PWS) during late fall and winter months. Initially our surveys were concurrent with hydroacoustic surveys for adult herring in northeast PWS. Beginning in March 2007, we expanded our winter survey efforts to other areas of PWS. Since then surveys have been conducted concurrent with either juvenile herring hydroacoustic surveys or with Humpback Whale surveys. Results from seven cruises conducted over two winters found consistent trends and species-distinct patterns in distribution. Habitat association modelling revealed that winter climate conditions may influence these distribution patterns. When we examined distribution at a fine- scale (1 km) using data from seabird transects with concurrent fish data, we found a positive association between presence of seabirds and predictable fish prey fields.

Post-spill ecosystem recovery and changing physical and biological factors all have the potential to affect PWS seabird populations. Here we propose to continue to monitor seabird abundance and habitat associations using multiple surveys during late fall and winter. While this proposal encompasses a five-year period, we would foresee this project continuing over a 20-year period in order for ecosystem changes to be detected.

Objectives of this study include:

1) Characterize the spatial and temporal abundance of seabirds in PWS during late fall and winter.
2) Correlate species abundance and distribution to physical factors.
3) Assess seabird habitat associations within and between winters.
4) Relate species composition and distribution to prey fields.

This study will be a continuation of systematic late fall and winter seabird surveys begun in 2007. Surveys will be conducted during October, November, December, January, and March. Depending on the vessel of opportunity used, surveys will either be coupled with fish hydroacoustic surveys (November and March) or Humpback Whale systematic surveys. (October, December, January) All surveys employ established U.S. Fish and Wildlife Service protocols for a fixed-width (300m) transect, and adapted for GPS-integrated data entry programs. Transects that are coupled with hydroacoustic fish surveys would occur in four to eight select bays in PWS. Seabird surveys conducted onboard Humpback Whale surveys will follow specified routes from northeast to southwest PWS. Depending on the results from the 2010-2011 winter season, nighttime surveys employing infrared cameras and a variable width transect may be conducted when possible.

Linkages:

Injured Species: Our study concerns several injured seabird species that overwinter in PWS: marbled murrelet, an injured species with an unknown recovery status, as well as pigeon guillemot, a species that has not recovered. Kittlitz's murrelet is a species frequenting PWS during some winters that has not recovered. Other seabird species initially injured by the spill and wintering in PWS include common loon, cormorants (pelagic, red-faced, and double-crested), common murre and bald eagle. In addition, our project will provide information of the impact of these seabird species on Pacific herring, a species that has not recovered since the Exxon Valdez oil spill.

Other data sets:

Seabird data sets: Since 2004, winter seabird surveys have been performed on vessels conducting hydroacoustic surveys for adult herring (5 cruises, 2004-2006) and juvenile herring (8 cruises, 2007 to present). In addition, seabird surveys have been performed on vessels conducting Humpback Whale surveys (6 cruises, 2007-2009).

Fish data sets: The November and March seabird transects will be conducted concomitant with hydroacoustic fish surveys. Data on fish biomass (kg/m2) by depth will be available for each trackline. In addition, data on composition of fish schools will be available from a separate project that is part of the Herring long-term monitoring program.

Humpback Whale data: The October, December, and January seabird transects will be conducted concomitant with whale monitoring efforts. Information on fish and invertebrate prey fields around whale foraging areas will be made available.

Zooplankton data: Late fall and early winter zooplankton surveys will be conducted in October and November each year and will be conducted in the SEA bays and the major entrances to PWS. We will examine zooplankton data to see if there are linkages to seabird hotspots observed during October, November and December cruises.

ShoreZone data: All seabird observations will be linked to the ShoreZone database using Arc GIS. This standardized system catalogs both geomorphic and biological resources along the PWS coastline at mapping scales of better than 1:10,000.

Alaska Ocean Observing System data: All seabird observations will be linked to the AOOS bathymetry data using ArcGIS.

Logistics:

This project relies on vessels of opportunity from two long-term monitoring projects. One seabird observer (PWSSC staff) will be onboard all whale monitoring cruises (Oct, Dec, Jan; years 1-4) as well as herring monitoring cruises (Nov and Mar; years 2-5). Cruises begin in Cordova, and therefore the staff member would not need to travel.

Title: Data synthesis, analysis and recommendations for sampling frequency and intensity of nearshore marine bird surveys to detect trends utilizing existing data from the Prince William Sound, Katmai and Kenai Fjords coastlines

Proposer: Heather Coletti, Marine Ecologist, Southwest Alaska Network Inventory and Monitoring Program, National Park Service, Heather_Coletti@nps.gov, 907-644-3687

Collaborators: David Irons, James Bodkin, Brenda Ballachey, Tom Dean

Problem Statement:

The National Park Service (NPS) Southwest Alaska Network (SWAN) Inventory and Monitoring Program (I&M) and the US Fish and Wildlife Service (USFWS) have been conducting skiff based surveys for marine birds along the Prince William Sound, Katmai and Kenai Fjords coastlines for over 5 and 20 years, respectively. These surveys do not currently account for imperfect detection nor do they focus on any single species in particular or nearshore habitat type. However, within the SWAN program, the goal is to estimate trends for a select group of marine bird species reliant on the nearshore food web and and that were impacted by the *Exxon Valdez* Oil Spill. These include: black oystercatchers (*Haematopus bachmani*), cormorants (*Phalacrocorax spp.*), glaucous-winged gulls (*Larus glaucescens*), goldeneyes (*Bucephala spp.*), harlequin ducks (*Histrionicus histrionicus*), mergansers (*Mergus spp.*), pigeon guillemots (*Cepphus columba*), and scoters (*Melanitta spp*.).

From preliminary analysis of NPS data, the current survey design does not provide variance estimates for detecting trends for the identified indicator species with suitable confidence (<0.50) depending on the species. We utilized coefficients of variance (CVs) to determine within year as well as across year variation for each species. NPS determined that we may not be adequately surveying for some species possibly because: (1) certain species are highly aggregated (2) we are focusing on inappropriate habitat for the species in question, (3) our sample size is too small or (4) the year to year variation in distribution is great enough that we should be conducting replicate surveys within a single season.

We are proposing to continue to monitoring existing transects to have continuity with legacy data, but to improve on existing protocols by minimizing variation by examining the effects of sampling error and imperfect detection while also making recommendations to improve efficiency through sample intensity and frequency.

This will lead to a better sense of what the trends are of specific species (listed above) across the western Gulf of Alaska and increase efficiency as we move forward in our efforts to monitor species of interest within the *Exxon Valdez* spill area.

Concept:

We propose to use existing datasets from Prince William Sound, Katmai and Kenai Fjords to conduct data synthesis and analysis to answer questions regarding sampling intensity and sample frequency for detecting trends. These are essential components to building a long-term monitoring program. Even though critical thought has gone into this in the past, it seems prudent to utilize existing data to examine the following:

A. Use existing data in simulations, in a Bayesian framework, to estimate number of samples and sample frequency required to detect a specified trend or change with some level of confidence for selected species/species groups' density/abundance.
    i. The levels of change or trend deemed ecologically significant will be specified by the investigators.

B. Determine impact of imperfect detection
    i. Conduct a series of simulations applying different levels of detection bias, based on best available information, to evaluate the effects of various levels of detection bias (and variability therein) on some true population trend.
    ii. Assuming detection probabilities are not constant through time; determine the magnitude of the effects of variation in detection probability on trend estimates and the ability to detect trends if present.

This approach to the long-term monitoring effort may be a way of displaying for the Trustees that we are thinking about a long-term, sustainable monitoring program that will allow us to estimate trends that we deem ecologically important across a variety of temporal and spatial scales and providing information to inform the group of the scale and intensity of monitoring needed over potentially 20 yrs and cost saving due to reduced sampling where feasible based on simulation results.

There may be increased costs on the front-end for data synthesis and analysis, but if results allow for a decrease in sample intensity OR can identify areas that may require more efforts, the upfront costs may be minimal to the long-term costs of unnecessary sampling or poor power to detect trend.

Linkages:

This exercise with utilize and link datasets spanning several years within Prince William Sound, Kenai Fjords and Katmai. Focal species include those that have exhibited protracted recovery from EVOS. This work would be an interagency effort between NPS, USFWS and USGS to improve the power to detect trends of coastal marine birds across the entire spill area.

Logistics/Budget:

Data synthesis, analysis and reporting of results will be a one-time cost awarded to a contractor or university. Estimated cost for this work is approximately **30K**. The NPS/SWAN program will provide all existing data for the Kenai Fjords National Park and Katmai National Park and Preserve coastlines. The USFWS will provide all pertinent survey data from PWS. The NPS/SWAN will also provide a marine ecologist to assist the contractor in the data synthesis, provide expertise as to ecosystem processes and provide assistance in the compilation and reporting of results. NPS/SWAN estimates that the in-kind support is equivalent to approximately **20k.** See table below.

PROJECT TITLE: Continuing the Legacy: Prince William Sound Marine Bird Population Trends

Proposer(s): Dr. David B. Irons and Dr. Kathy Kuletz, Migratory Bird Management, U. S. Fish and Wildlife Service, david_irons@fws.gov, (907) 786-3376

Collaborators: Jim Bodkin, Brenda Ballachey, Tom Dean, John Piatt, Heather Coletti

Statement of the Problem:

McKnight et al. (2008) examined whether marine bird and mammal species designated as injured by the *EVOS* Trustee Council had shown signs of recovery by 2007. Data collected from 1989 to 2007 in the oiled area indicated that common loons (*Gavia immer*) and cormorants (*Phalacrocorax spp.*) are increasing. Numbers of all other injured species are either not changing or are declining in the oiled area. Populations of harlequin ducks (*Histrionicus histrionicus*), black oystercatchers (*Haematopus bachmani*), Kittlitz's murrelets (*Brachyramphus brevirostris*), and common murres *(Uria aalgae*) are showing no trend in the oiled area; pigeon guillemots (*Cepphus columba*), and marbled murrelets (*Brachyramphus marmoratus*), are declining in the oiled areas of Prince William Sound in summer. Pigeon Guillemots are the only bird on the EVOSTC injured species list that is "not recovering". In addition Kittlitz's murrelet is a candidate species under the Endangered Species Act and PWS is one of the few remaining hotspots for it. There are no other surveys done in PWS to get population estimates for marine birds.

Using small boat surveys, this project will collect additional information to monitor the distribution and abundance of marine birds and sea otters in Prince William Sound. These data will be combined with data collected in 1989-91 (Klosiewski and Laing 1994), 1993 (Agler et al. 1994a), 1994 (Agler et al. 1995a), 1996 (Agler and Kendall 1997), 1998 (Lance et al. 1999, Irons et al. 2000, Lance et al. 2001) and 2000 (Stephensen et al. 2001), 2004 (Sullivan et al.2005), 2005 (McKnight et al. 2006), and 2007 (McKnight et al. 2008) to examine trends in marine bird distribution and abundance. This project will benefit restoration of Prince William Sound by determining whether populations that declined due to the spill are recovering and by identifying which species are still of concern.

Objectives:

To determine population abundance, with 95% confidence limits, of marine bird populations in Prince William Sound during March and July 2012, 2014 and 2016 in both oiled and unoiled regions, as well as in Prince William Sound as a whole, in order to assess population trends in the years following the EVOS.

Methods:

Survey methodology and design will remain identical to that of past marine bird surveys conducted by the U. S. Fish and Wildlife Service in 1989, 1990, 1991, (Klosiewski and Laing

1994), 1993 (Agler et al. 1994a), 1994 (Agler et al. 1995a), 1996 (Agler and Kendall 1997), 1998 (Lance et al. 1999), 2000 (Stephensen et al. 2001), 2004 (Sullivan et al. 2005), 2005 (McKnight et al. 2006), and 2007 (McKnight et al. 2008). We will conduct two surveys: one during March ("winter") and another during July ("summer") 2010. We will use three 7.7 m fiberglass boats traveling at speeds of 10-20 km/hr to survey transects over two 3-week periods.

We will continue to use a stratified random sampling design containing three strata: shoreline, coastal-pelagic, and pelagic (Klosiewski and Laing 1994) (Fig. 1). The shoreline stratum will consist of waters within 200 m of land. Irons et al. (1988b) divided this stratum, by habitat, into 742 transects with a total area of 820.74 km^2. We will locate shoreline transects by geographic features, such as points of land, to facilitate orientation in the field and to separate the shoreline by habitat (Irons et al. 1988a,b). Shoreline transects will vary in size, ranging from small islands with <1 km of coastline to sections of the mainland with over 30 km of coastline. Mean transect length will be 5.55 km. During winter, we plan to survey 99 shoreline transects, but this number varies among years, due to weather conditions and ice blockage. During summer, we plan to survey 212 shoreline transects. All transects were randomly chosen, and the same transects are used each survey (Klosiewski and Laing 1994).

Justification:

Almost 30,000 marine bird (Piatt et al. 1990) and 900 sea otter (DeGange and Lensink 1990) carcasses were recovered following the *Exxon Valdez* oil spill. Based on modeling studies using carcass search effort and population data, an estimated 250,000 marine birds were killed in Prince William Sound and the northern Gulf of Alaska (Piatt and Ford 1996). Garrott et al. (1993) estimated that 2,800 sea otters also were killed. These estimates are probably low, because they only include direct mortality occurring in the first five months after the spill.

Twenty two years after the EVOS there are populations of Pigeon Guillemots, Kittlitz's Murrelets, and Marbled Murrelets are down by 50% to 90% compared to population numbers in 1989 after the initial mortality. All these species were affected by the spill, but are likely no longer being affected, however populations have never recovered. All three species rely on Pacific Herring during the summer breeding season and may be impacted by the herring crash of 1993.

There are no other studies monitoring population trends of these or any other marine bird species in PWS.

Linkages:

Pigeon Guillemots, Kittlitz's Murrelets, and Marbled Murrelets have continued to decline after the spill. All three species rely on Pacific Herring during the summer breeding season and may be impacted by the herring crash of 1993.

The EVOSTC has funded 11 surveys in 22 years to following population trends of marine birds in Prince William Sound. This is the best at-sea data set for marine bird populations in Alaska. This data set has been used to track recovery or lack of recovery for several injured species. It also provides the only information on the population trend of Kittlitz's murrelet, an ESA candidate species.

This component will provide the data on marine bird and mammal populations for the Benthic Nearshore Project.

Sea otters are counted on these surveys as well as marine birds.

Major Logistics:

A charter vessel in the winter time for 10 days in March that sleeps nine.

During summer (July) three 25' Fiberglass boats will be used and housing will be at a remote lodge.

Title: Monitoring long-term changes in forage fish distribution, abundance, and body condition in Prince William Sound

Authors: John Piatt and Mayumi Arimitsu, U.S. Geological Survey, Alaska Science Center

Problem Statement: Fluctuations in forage fish abundance can have dramatic ecosystem effects because much of the energy transferred from lower to higher trophic levels passes through a small number of key forage species. Forage fish typically produce a large number of offspring and have short lifespans, and these traits predispose populations towards large fluctuations in abundance, with associated impacts on predators. In response to a lack of recovery of wildlife populations following the *Exxon Valdez* Oil Spill (EVOS), and evidence of natural background changes in forage fish abundance, there was a significant effort to document forage fish distribution, abundance, and variability in Prince William Sound (PWS) in the 1990's. Since then, ongoing research has focused on commercially valuable Pacific herring, whereas less has been done to monitor other ecologically important forage species such as Pacific sand lance, capelin, eulachon and euphausiids (which we include under the generic term "forage species"). The lack of time series data on abundance and distribution of these forage species in PWS, and the spatial and temporal variability inherent to these populations makes it difficult to assess population status and trends of most forage species. We propose to initiate a program to monitor: 1) forage fish abundance and community composition; by conducting fishing and acoustic surveys of abundance and distribution that are cost effective and allow for long-term trend analyses; and, 2) indices of forage fish biology that are important in maintaining predator health, such as forage fish body size, condition, and proximate composition.

Project Concept: We propose to gather new data on the distribution, relative abundance, and body condition of forage fish species in PWS, compare these data with some historical data from the 1990's and provide a baseline for future assessment of population trends. The specific objectives of this study are to:

1) Identify robust indices for monitoring forage fish populations over time and devise a sampling strategy for long term monitoring of those indices.
2) After completing Objective 1, and in addition to any other indices we might identify, assess the current distribution, abundance, species composition, and body condition of forage fishes (other than herring) in selected areas of PWS and at selected times of year.
3) Relate abundance and distribution of forage species to abiotic and biotic characteristics of the marine environment.

During the initial planning phase, we will consider how to replicate some of the APEX forage fish work previously supported (~650 K annually) in PWS by the EVOSTC in order to obtain useful trend information on fish abundance. We will determine the most appropriate sample design by examining historical data and consulting with other PI's (e.g., Rice, Brown, Thedinga, Haldorson, Coyle, Ostrand) on past and current projects. Options might include intensive sampling of one or two sites in PWS every year, random sampling of the entire Sound each year, intensive sampling of different sites within PWS each year, or sampling different areas of the Gulf of Alaska in sequential years (e.g., PWS, Kenai Fjords, Kachemak Bay, Lower Cook Inlet). Because biomass may fluctuate considerably at small to large spatial and temporal scales, other useful indices of population change may be obtained from studies over time, such as: species composition within trawl and seine catches, proximate composition of fish, and other measures of body condition (length-weight relationship, isotopic and fatty acid signatures, age structure, etc.).

To achieve our second and third objectives, we will conduct hydroacoustic-trawl surveys using a random-stratified sample design that includes extensive environmental sampling at each station. The design will include elements of forage fish studies we conducted in lower Cook Inlet with EVOSTC funding in 1996-2000, forage fish studies in Glacier Bay and Kenai Fjords national parks in 1999-2008, and a survey we recently completed in Harriman and College fjords in July 2010 in collaboration with USFWS (D. Irons). We will simultaneously measure marine predators, forage fish assemblages and marine habitat by overlaying a 2.5 km^2 grid over navigable waters in PWS. Cells to be sampled will be selected at random after stratifying by habitat type (e.g., glacial, nearshore, offshore). At each station, we will sample a transect equal to the length of the cell by: 1) surveying for marine birds and mammals, 2) collecting hydroacoustic data, 3) sampling sea surface temperature and salinity, and, 4) sampling fish with a modified herring trawl. At a station on each transect we will conduct a vertical plankton tow, obtain an oceanographic profile of the water column, and collect water samples for nutrients and chlorophyll *a* analyses. Forage fish inhabiting shallow nearshore waters will also be sampled with a beach seine on appropriate nearshore sites (e.g., suitable beach substrate, historical sample site, proximity to benthic studies sample site). A suite of parameters will be measured at each station including: bird density, mammal density, hydroacoustic fish biomass, fish CPUE, fish species composition, zooplankton biomass and species composition, phytoplankton abundance, nutrient concentration, hydrographic properties of the water column (temperature, salinity, beam transmittance, fluorescence, dissolved oxygen, light), bathymetry (depth, slope), and geographic topography (distance to glaciers, marine sills, streams, etc). The simultaneous collection of all these variables will allow us to model community structure (through ordination techniques like MDS) relative to important habitat features (PCA, gradient boosted regression trees, etc.). Based on our work in College and Harriman Fjord in 2010, we expect to obtain numerous samples of important forage species including capelin, eulachon, sand lance, herring, euphausiids, etc., which can then be analyzed to assess body condition, proximate composition, stable isotope composition, etc. using appropriate laboratory methods.

Linkages: We will make use of current and previous forage fish work in PWS— including that of ongoing herring assessments, the Sound Ecosystem Assessment (SEA) program, and the forage fish component of the Alaska Predator Ecosystem Experiment in PWS (APEX)— to help design our sampling and monitoring plan, and to make meaningful comparisons with past and current findings. We will also seek out and incorporate unpublished information for non-target species (e.g., eulachon, capelin) in bycatch data from NOAA RACE surveys, and work conducted at the Prince William Sound Science Center (e.g., Thorne *et al*., Bishop *et al*.), and University of Alaska (e.g. Iverson *et al*., Brown *et al*., Norcross *et al*.). We will coordinate our efforts with those of other PIs studying pelagic and nearshore components of the Sound, and provide them with data we collect that may be useful in their analyses. All oceanographic data will be archived with AOOS. Herring samples will be made available to PIs involved in dedicated herring studies, and samples of other forage species will be saved and distributed to PIs engaged in trophic studies using stable isotopes, fatty acids, etc.

Major logistics: We will conduct this research from the USGS R/V *Alaskan Gyre*, a 16 m vessel equipped with a midwater trawl designed specifically for forage fish work (the same net used in APEX surveys of PWS and Cook Inlet in the 1990s). Twenty-day cruises will coincide with the peak in forage fish abundance and timing of previous work (July-August) for four years, and a funding for a fifth year will go towards analysis, reporting, and preparation of manuscripts. Based on experiences elsewhere, we expect that the total of 20 ship days will allow us to trawl and sample about 70 stations, conduct beach seines on 15-20 beaches, collect ancillary environmental data and allow for vessel travel time to PWS, travel between sites, and occasional weather days.

Budget: Funding required to complete this research is outlined in the table below. USGS will make a substantial contribution of personnel time for PIs (0.8 FTE GS-11, 0.2 FTE GS-15), half of the vessel costs for annual cruises, and all the field equipment required including sampling nets (beach seine, modified herring trawl, zooplankton nets), oceanography equipment (CTD with rosette and external sensors, thermosalinograph), BIOSONICS DTX-4000 digital hydroacoustic equipment, and small boats. We request funding for 1FTE at the GS-9 level, 0.6 FTE at the GS-7 level, and 0.4 FTE at the GS-5 level. Travel funds will cover the field trips and meetings for the PI and other personnel. We will split the vessel costs equally between USGS and EVOS funding for cruises each year. Equipment and supplies will include an EchoView software license for acoustic data processing (year 1), and also calibration and maintenance for oceanographic equipment (all years). External contracts will include zooplankton processing, nutrients and chlorophyll a analyses, and stable isotope analyses. Indirect costs include 9% overhead.

Long-term killer whale monitoring in Prince William Sound/ Kenai Fjords

Craig O. Matkin, Principal Investigator

Eva Saulitis, Co-operating Investigator
Graeme Ellis Co-operating Investigator
John Durban Co-operating Investigator
Ward Testa Co-operating Investigator

Justification

Both resident ecotype (AB pod) and transient ecotype (AT1 population) killer whales suffered significant mortalities following the *Exxon Valdez* oil spill in 1989. AB pod is recovering after 22 years but has still not reached pre-spill numbers. The AT1 population is not recovering and may be headed toward extinction. This project has determined that killer whales are sensitive to perturbations such as oil spills, but has not yet determined the long term consequence (extinction) or the recovery period required for AB pod. As an APEX predator, this species has impact on the ecosystem (fish and marine mammals); additionally they are a primary focus of viewing for a vibrant tour boat industry in the region, and can be closely monitored. This is a unique opportunity to continue a comprehensive database for a keystone species in the region. The wisdom of long-term killer whale monitoring has been borne out in other regions such as Puget Sound and British Columbia. Data from this project is used by tourboats in the region to enhance viewers experience and understanding of the local environment and fauna.

Project Concept

This project will continue monitoring of individual killer whales through photoidentification and maintain individual histories that allows continued development of our population dynamics model. It maintains monitoring of blubber chemistry that regularly assesses contaminant levels and changes in dietary habits. Finally we will continue monitoring movement data through resighting by photoidentification and tracking with ARGOS satellite tags. This yields pod and group specific information on range and preferred habitat and aids in determination of the vulnerability of specific groups to regional perturbations (eg which pods would be most susceptible to another oil spill in the Sound). Additionally satellite tracking allows relocating groups of whales, greatly facilitating the overall monitoring effort.

Objectives:

1) Photo-identification of all major resident pods and AT1 transient groups that use Prince William Sound/Kenai Fjords on an annual basis. Realistically, all pods are completely documented on a biennial basis, despite annual field effort. Extension of individual histories, identification catalogues of individuals and an annual update of population model are products of these data.
2) Collection of of blubber samples for chemical monitoring of PCBs, DDT's and PBDE's, lipids /fatty acids and stable isotope values to gauge changes in contaminant loads as well as feeding habit changes. Most analytical costs are borne by NOAA fisheries.
3) Collection of fish scale samples and marine mammal tissue from kill sites to monitor potential changes in feeding habits
4) Collection of genetic tissue samples (Genetic analytical costs paid by NMML/UBC)

5) Tracking of individuals/pods using ARGOS satellite telemetry to improve re-sighting rate and foster completion of objectives 1-3
6) Determine details of range of pods/populations using both ARGOS and photoidentification data and identify important habitat on a pod specific basis

The field work consists of three major activities. First, photo-identification will be completed using Nikon D700 digital cameras to obtain photos of every individual in major resident pods and AT1 trasnsient groups, as well as of other killer whales that are encountered. (Humpback whales are photographed opportunistically as time allows.) Second, biopsy samples for chemical analysis and genetics will be collected using an air powered rifle and small floating biopsy darts that are easily retrieved. This technique has been used since 1994. Finally, ARGOS Spot 5 satellite tags manufactured by Wildlife computers will be attached with specially designed darts to specific whales to track movements over periods ranging from weeks to months.

Survey days and encounter data is logged in an Access database maintained by NGOS and the Alaska Sea Life Center. Data analysis includes a frame by frame analysis of all digital images, with individual identifications digitally recorded and attached to the photo. Improvement photos of each individual are selected and placed in appropriate folders and used to update catalogue (for NGOS and public access) and provide reference for future identifications. The population dynamics data base that lists data on each individual (including newly recruited calves) is updated annually. All vessel and encounter tracklines are stored in GIS format, ready for analysis. ARGOS tracklines are also placed in GIS format and initial analysis and mapping completed on an annual basis.

<u>Project Integration</u>

This project is a continuation of the longest running photo-identification, movement, and blubber chemistry database for any small cetacean in Alaska and has been supported by the Trustee Council for 22 years. This database extend back to 1984 and has made assessement of damages to killer whales possible both during interactions with long-line fishermen and following the *Exxon Valdez* oil spill. Additionally, during killer whale monitoring we have opportunistically collected substantial individual ID/population data on humpback whales during spring, summer, and early fall and will continue to do so to complement the proposed fall/winter humpback monitoring program. The proposed winter humpback monitoring program will opportunistically collect killer whale data to complement our seasonal data collection.

<u>Project Logistics</u>

Annual monitoring is a time consuming process, requiring 50 days of field time to insure the continuation of data sets on the major resident pods (including AB pod) and important transient groups. Even with this amount of time, complete coverage typically occurs on a biennial basis. We request a base vessel lease of 40 days/year from EVOS funds. NGOS will supply an additional 10-20 days of survey time via foundation grants or other funding. Since the PI and others involved in the project are experienced vessel operators, no paid captain is necessary. Approximately 50% of the costs of monitoring of contaminants and blubber chemistry (via Northwest Fisheries Science Center) with the remaining 12 K in funds supplied by NWFSC. Major commodities(other than food and fuel) include 8 ARGOS tags. Included in the budget is 5 months salary for the PI and 2.5 months salary for a field biologist. Funded non-field activities include photographic analysis, data input and analysis, updating of photo-catalogue and supplying digital version to tourboat companies, GIS analysis of effort data, encounter data, and satellite tag data; and ongoing population dynamics analysis. Reports are the responsibility of the PI.

Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound

Principal Investigators: John R. Moran (NOAA) and Janice M. Straley (UAS)

Co-operating Investigator: Terrence J. Quinn II (UAF)

Justification

Humpback whale predation has been identified as a significant source of mortality on wintering Pacific herring in Prince William Sound (EVOSTC project PJ090804). At current herring and whale population levels the loss of pre-spawning herring during the fall and winter months is equivalent to the percentage of herring removed during the final years of the commercial herring fishery. Hence, top down forces (predation and disease) are the likely dominating forces constraining the current recovery. Humpback whales in Prince William Sound have a higher percentage of herring in their diet during the winter months and forage longer on wintering herring shoals than their counterparts in Southeast Alaska. With humpback whale population in the North Pacific increasing at 5-7% annually, there is a need to continue evaluating predation pressure on herring until stocks in Prince William Sound fully recover, and to proceed toward enhancing the age structure model to include a better estimate of predation for a more accurate predictor of the herring population.

Project Concept

This project will evaluate the impact by humpback whales on Pacific herring populations in Prince William Sound. Following protocols established during the winters of 2007/08 and 2008/09 we will continue to monitor the seasonal trends and abundance of humpback whales in Prince William Sound. Prey selection by humpback whales will be determined through acoustic surveys, visual observation scat analysis and prey sampling. Chemical analysis of blubber samples (stable isotopes and fatty acid analysis) will provide a longer term perspective on whale diet and shifts in prey type. These data will be combined in a bioenergetic model to determine numbers of herring consumed by whales , with the long term goal of enhancing the age structure modeling of population with better estimates of predation mortality.

Objectives:

8) Population estimates of humpback whales through the use of photographic mark- recapture models.
9) Monitor the seasonal trends of humpback whales in Prince William Sound relative to prey.
10) Estimate inter-annual trends in humpback whale abundance.
11) Determine the diet and dietary shifts of humpback whales.
12) Estimate predation rates on herring by humpback whales.
13) Incorporate mortality rates into herring age structure models.

The field work for this proposal will center around three (~6 days) cruises each year during the fall and winter months for years 1-4 followed by a year of data synthesis (year 5), with the outlook of continuing this pattern of monitoring for up to 20 years. Additional information on the seasonal abundance and distribution of humpback whales will be obtained using opportunistic surveys throughout the year by local residents and boat operators, as well as photo ID contributed by the killer whale project in the summers.

Project Integration

We expect strong collaboration between humpback whale, killer whale and seabird components of the pelagic monitoring projects. The proposed killer whale monitoring program will opportunistically collect humpback whale data during summers; likewise the observation of killer whales will be documented during winter humpback whale cruises. We will be able to provide a berth for a seabird observer on all humpback whale cruises.

Project Logistics

For this project, John Moran (NOAA) will provide overall project management, logistics, photographic field captures, prey capture, and chemical analysis. . Co-PI Jan Straley (UAS) will participate in photographic field captures, and lead the analysis of photographic IDs, , providing IDs and connection to photographic ID databases for all humpback whale photographs, quality assuring that permitting requirements are met, and collaborating with other whale researchers. Dr. Quinn (UAF) will lead the modeling efforts incorporating whale predation into the herring population models.

Humpback whale vessel survey schedule for Prince William Sound.

Month	**FY12**	**FY13**	**FY 14**	**FY15**	**FY16**
Oct	6 days	6 days	6 days	6 days	Synthesis
Dec	6 days	6 days	6 days	6 days	Synthesis
Feb	6 days	6 days	6 days	6 days	Synthesis
Total vessel days	**18**	**18**	**18**	**18**	**0**

LINGERING OIL: MONITORING SHORELINES AND NEARSHORE VERTEBRATES IN PRINCE WILLIAM SOUND

Prepared for the Exxon Valdez Trustee Council

Principal Investigators:

Mark Carls, Mandy Lindeberg, and Jeep Rice
NOAA/NMFS Auke Bay Laboratory
11305 Glacier Hwy
Juneau, AK 99801

Brenda Ballachey and James Bodkin
USGS Alaska Science Center
4210 University Drive
Anchorage, AK 99508

Daniel Esler
Simon Fraser University and Pacific Wildlife Foundation
5421 Robertson Road
Delta, BC V4K 3N2, Canada

Keith Miles and Liz Bowen
USGS Davis Field Station
1 Shields Ave, UC Davis
Davis, CA 95616-5224

SUMMARY

Intertidal areas in western Prince William Sound were extensively coated with *Exxon Valdez* oil in 1989, and oil still remains in many beaches. Over the past decade, continuing exposure has been demonstrated in numerous vertebrate species that inhabit nearshore areas, including sea otters and harlequin ducks. While the lingering oil is no longer the dominating effect compared to the early years of the spill, it is still important to document the lingering exposure. Lingering oil has been tracked for two decades, including the exposure to sea otters and harlequin ducks, and provides the best long term data set relevant to lingering oil exposure for any spill in the world. Further, this spill gives us the best insight relevant to future spills in Alaska, as the state will continue to produce and transport large quantities of oil for several more decades. This project proposes to:

(1) revisit approximately 12 of the worst case shoreline sites to continue the long term data set that tracks oil quantity and weathering composition in the contaminated sediments, establishing long term oil monitoring sites that would be re-sampled every 5 years over the next 20 years, and

(2) resample harlequin ducks and sea otters in western PWS to evaluate continuing exposure to lingering oil and status of recovery; sampling of each species would be conducted once in the next 2 years (2012 or 2013); subsequent sampling of these species would only be considered if results from 2012/2013 demonstrate continuing exposure.

Attached are two proposals outlining these efforts.

Extending the Tracking of oil levels and weathering (PAH composition) in PWS through time

Mark Carls, principal investigator; Mandy Lindeberg and Jeep Rice, cooperating investigators

Justification

Intertidal areas in western Prince William Sound were extensively coated with Exxon Valdez oil; oil still remains in many beaches, presumably with declining impacts on intertidal invertebrates such as mussels, and also predators such as sea otters and harlequin ducks. This project would revisit approximately 12 of the worst case sites to continue the long term data set that tracks oil quantity and weathering composition in the contaminated sediments, and establish long term oil monitoring sites that would be re-sampled every 5 years over the next 20 years.

This project fills two needs: understanding the "dose" levels (past and present) for species such as mussels, intertidal invertebrates, sea otters, and harlequin ducks; and (2) understanding the natural degradation of quantity and composition of PAH over a long time course. Understanding exposure doses is important to injured species, and this would complement the biomarker analyses of lingering exposure on sea otters and harlequin ducks (Ballachey; Esler). Understanding oil loss over time is important for understanding full recovery of the habitat; in Alaska, this time course is apparently longer than in lower latitude environments. This study would complement and extend previous work, and would complement the remediation studies by Boufadel in 2011-12 as well as the Irvine study outside of PWS in 2011-12.

Project Concept

Continue monitoring a subset of beaches in Prince William Sound where sequestered oil is predicted to linger for long periods of time (decades). At least three predictive data sets will be considered in determining which beaches are monitored: (1) mussel bed time series started in the early 1990s[1], (2) beach surveys that were continued up to 2004[2], and spatial modeling analysis that was initiated in 2008[3]. Sampling techniques will allow extension of time series data (where they exist), detailed examination of hydrocarbons present (including PAHs, alkanes, and chemical biomarkers), verification of hydrocarbon source, weathering state, and estimation of the amount of remaining oil at specific sites. In addition to sediment samples, mussel tissue will also be examined for hydrocarbon loads to determine if PAHs are biologically available without sediment disturbance (such as that created by foraging activities). A limited number of passive samplers may be deployed in pits dug for sampling purposes to demonstrate the potential for biological exposure if (or when) sediment is disturbed.

Chemical analyses will be upgraded to include chemical biomarker data (terpanes, hopanes, and steranes); these compounds are the most recalcitrant compounds to biodegradation and weathering, and will yield a more complete picture of the biodegradation/weathering that has occurred over the last 25 plus years and the future 20 years. Biomarker data have not been collected in the past but are being incorporated in the remediation studies of 2011. We will analyze new samples, but also re-analyze samples collected in the past that are still stored and compliment the future sampling, plus Exxon Valdez source oil. In addition, biomarkers will be measured in a limited number of other known (stored) sources (Constantine Harbor, coal, and Monterey oil) for comparison and contrast with Exxon Valdez oil.

Lastly, to ensure integration between projects and with past monitoring, we will analyze a limited number of sediment samples collected from the intertidal monitoring project (e.g. from sea otter pits) and maintain the hydrocarbon database including new entries of all new sampling.

Future intentions: The periodic sampling (every 5 years) should be extended for three more cycles, ending on year 40 of the post spill era.

Objectives:

Objective 1. Determine quantity and weathering state at 12 beaches in PWS, in 2014, 25 years post spill.

a. Year 1 (2012). Retrospective analysis of biomarkers in Exxon Valdez oil, weathered Exxon Valdez oil, and other potential source oils in Prince William Sound (Constantine Harbor, coal, and Monterey oil). (year 2: Draft a biomarker report (and paper).

b. Year 2 (2013), determine specific subset of beaches to be sampled.

c. Year 3 (2014). Major field effort, 25 years after the spill.

i. Visit 10-12 beaches, collect sediment samples for PAH concentration and weathering profiles

ii. using random quadrats, measure the quantity of oil on specific beaches to estimate the quantity present.

iii. Collect mussels near oil patches to determine bioavailability in tissues.

iv. Place a limited number of passive samplers in disturbed areas to model oil bioavailability resultant from foraging activity. Pair these with samplers deployed without disturbance.

v. year 3,4. Begin and end the chemical analyses of samples collected in primary field effort, using state of the art GCMS, with chemical biomarkers included.

Objective 2- supplemental support analyses: Support on-going intertidal projects with chemical analyses, such as determine PAH levels in sea otter pits or prey items. This will integrate with the sea otter and harlequin duck biomarker measurements in those studies. 10-20 samples per year

Objective 3- Database: Maintain and add new data to the hydrocarbon database.

a. Add new information to hydrocarbon database. (This database contains data from all NRDA hydrocarbon samples from 1989 to present, including numerous data sets from investigators outside ABL.)

b. Prepare a complete FOIA package (100% of the chemical analyses have been FOIAed in the past, and these data will likely also be FOIAed.

Objective 4- Products: prepare annual and final reports as needed; supply collaborators with appropriate data (e.g. sea otter pit data to sea otter PI. Prepare synthesis manuscript summarizing environmental progress after 25 years.

Methods

1. Chemical analyses: Standard operating procedures developed at the Auke Bay Laboratories for hydrocarbon analysis will be used for all sample analyses. These have resulted in numerous peer-reviewed publications.
2. Beaches will be randomly drawn from the identified group of oiled beaches (n = 12).
3. Beach segments will be up to 100 m long. Sampling by quadrat will be random across beaches, divided by upper, middle, and lower tide intervals; all based on past studies.
4. Beaches will be accessed by charter boat during spring or summer months during one cruise. Passive samplers will be deployed at the front end of the cruise and picked up at the back end.

Project integration

1. This project continues hydrocarbon analyses started prior to 1989 in Prince William Sound and recorded in a hydrocarbon database that encompasses multiple agencies, collection sites, and matrices. This database has been maintained by Auke Bay Laboratory (ABL) personnel since the time of the Exxon Valdez oil spill.
2. The major field sampling of 2014 will use methods developed in earlier studies and will conform to those methods for intercomparison over time.
3. This project will complement "effects" studies by including some sampling/analyses specifically targeted to those projects, and will complement the remediation studies of Boufadel (same analyses with chemical biomarkers included), and will complement the tracking study by Irvine outside of PWS.

Project Logistics:

Major field effort in PWS in 2014 will be on a local charter, consisting of a field crew of up to 6 people. Federal personnel will lead the cruise effort, although some contract labor will likely be used for the labor intensive beach surveys. Laboratory logistics (chem labs, GCMS) will be at the Auke Bay Laboratories in Juneau Alaska. Senior staff will conduct the instrumental analyses, but processing effort will be by contractors.

Budget: total $ 199.2 K from 2012-2016

Note: No federal salaries are included; soft funded labor is, 9% agency overhead is not included. Federal contribution in FTP salaries will exceed 300K.

2012	2013	2014	2015	2016
$18K	12K	$155.2K	$8K	$6K

2012. Main activity is retrospective sample analysis

25 EVO (previously analyzed) samples including source oil & sediment for weathering series for chemical biomarkers. $200/sample = $5K

15 Constantine, coal, and Monterey samples * $200/sample = 3K

Supplies, contract labor, 1 Anc trip. 10K

0-20 samples from other projects: no charge. $500 per sample above 20.

2013. Main activity is completion of sample design and draft biomarker report

Supplies, contract labor, 1 Anc trip 12K

0-20 samples from other projects: no charge.

2014. Main activity is field sampling, hydrocarbon measurement

Charter cost $3000 per day * 14 d = $42K

Supplies, shipping, FTP trav for field trip 8K

0-20 samples from other projects: no charge

Contract labor (5 diggers for field effort, 30K includes travel to CDV)

Chemical analyses : (assumes 12 beaches) total of 74K

9 sediment samples per beach (3 from each zone) = 108 samples * 500 $/sample = $54K

3 mussel samples per beach = 30 samples * 500 $/sample = $15K

4 PEMDs per beach at 3 beaches = 12 samples * 400 $/sample = $5K

Travel: 1 Anc trip 1.2K;

2015. Main activity: continue hydrocarbon measurement

Supplies, contract labor, 1 Anc trip $8K

0-20 samples from other projects: no charge

2016. Main activity: complete data analysis, FOIA package, and draft report

Supplies, contract labor, 1 Anc trip: 8K

0-20 samples from other projects: no charge

1. Carls, M.G., Harris, P.M. *Monitoring of oiled mussel beds in Prince William Sound and the Gulf of Alaska*; NOAA / NMFS, Auke Bay Laboratory: Juneau, AK, **2005**.
2. Short, J.W., Irvine, G.V., Mann, D.H., Maselko, J.M., Pella, J.J., Payne, J.R., Driskell, W.B., Rice, S.D., Slightly weathered *Exxon Valdez* oil persists in Gulf of Alaska beach sediments after 16 years. *Environmental Science & Technology* **2007,** 41, 1245-1250.
3. Michel, J. *Report on recent lingering oil studies*; EVOSTC project 070801?: date unknown, **2010?**

Evaluating the Chronic Exposure of Harlequin Ducks and Sea Otters to Lingering *Exxon Valdez* Oil in Western Prince William Sound

Principle Investigators: Brenda Ballachey, US Geological Survey; Daniel Esler, Simon Fraser University and Pacific Wildlife Foundation
Co-Investigators: James Bodkin, Liz Bowen, Keith Miles, US Geological Survey.

Background & Justification

Sea otter and sea duck populations in western PWS were injured as a result of the *Exxon Valdez* oil spill, with evidence for both immediate acute mortality and longer term injury from chronic exposure to oil spilled in 1989. A series of EVOSTC projects have addressed population demographics including abundance, habitat use, and survival rates, together with biological sampling to monitor ongoing exposure using biomarker assays (the cytochrome P4501A biomarker to evaluate oil exposure in harlequins, and more recently, gene expression assays to evaluate exposure and health of sea otters).

For both sea otters and harlequin ducks, the most recent data suggest recovery is not yet complete. As part of EVOSTC Restoration Project 070808 (Nearshore Synthesis: Sea otters and sea ducks), harlequin ducks were examined for lingering exposure to residual *Exxon Valdez* oil. This work determined that harlequin ducks continued to show biomarker evidence of elevation of cytochrome P4501A in oiled areas through 2009, which was interpreted to indicate exposure to *Exxon Valdez* oil up to 20 years after the spill (Esler et al. 2010). For sea otters, recent studies (also part of Restoration Project 070808) have shown that sea otters in the vicinity of northern Knight Island have not yet returned to pre-spill abundance, and that they are foraging in intertidal areas where lingering oil persists in sediments (Bodkin et al. 2010; Bodkin et al. in review). Most recently, gene expression assays for sea otters have been developed, using an array of genes to specifically quantify oil exposure and health status of sea otters (Restoration Project 090841); that effort is close to final.

Project Concept

In this study, we propose to resample harlequin ducks and sea otters in PWS for biomarker assays to evaluate recovery status of these species by measuring continuing exposure to lingering oil, health and condition. Harlequin ducks are already scheduled for sampling in March 2011 (EVOS Restoration Project 11100808). If the 2011 results show no significant difference between oiled and unoiled areas in expression of CYP1A, then we request funding to resample harlequins in 2012. Alternatively, if we see a continued difference between areas in the 2011 sampling, then we request that the next sampling of harlequin ducks be deferred until 2013. Sea otters were last sampled in 2008, and we request funding to resample in 2012.

Objectives

Objective 1. Harlequin duck CYP1A sampling and analysis, as a measure of continuing exposure to lingering oil in PWS.

Objective 2. Sea otter sampling for gene expression assay, as a measure of continuing exposure and health of individuals in PWS.

Methods

Harlequin ducks: Methods will replicate those from previous work (Trust et al. 2000, Esler et al. 2010) to facilitate comparisons. In brief, we will capture harlequin ducks in several areas that were oiled during the *Exxon Valdez* oil spill, including Bay of Isles, Herring Bay, Crafton Island, Lower Passage, and Green Island, as well as at nearby unoiled northwestern Montague Island. In each area, 20 harlequin ducks will have small (< 0.5g) liver biopsies taken while under general anesthesia. Biopsies will be frozen in liquid nitrogen immediately and will be maintained in a frozen state until laboratory analysis at UCDavis by co-PI Keith Miles (and collaborators Jack Henderson and Barry Wilson). CYP1A induction will be determined by measuring hepatic 7-ethoxyresorufin-*O*-deethylase (EROD) activity, which is a catalytic function principally of hydrocarbon-inducible CYP1A enzymes. Data analysis will follow that of Esler et al. (2010) and will evaluate average differences in EROD between oiled and unoiled areas, accounting for any effects of age, sex, or mass.

Sea otters: Methods will replicate those used in 2008 (EVOSTC Project 090841). Sea otters will be captured in areas that were heavily oiled during the 1989 EVOS (primarily in Bay of Isles, Lower Passage and Herring Bay), and at nearby Montague Island to provide a reference sample from an unoiled area (15 per area). In addition, we will capture otters (n=15) in eastern PWS, to provide a second reference sample. Sea otters will be sedated and blood collected from the jugular vein into Paxgene tubes, and tubes shipped to UC Davis for gene expression assays by L. Bowen and K. Miles. A panel of 12 genes will be quantified, including genes identified in ongoing sea otter studies as showing variation across oiled and unoiled areas within PWS, following the methods and data analytical approach described in Miles et al. (draft EVOS report, *in preparation*).

Project Integration

This project will continue the biomarker studies that were initiated in 1996 in western PWS. Methods used will conform to those from earlier studies (for harlequins, back to 1996; for sea otters, new methodologies were applied in 2006). The project will complement studies proposed by NOAA ABL to continue tracking oil levels in intertidal sediments.

Budget

For one capture season:

	HADU	**SEOT**
Personnel	45K	--
Travel & shipping	9K	10K
Contracts	36K	63.5K
(*charter, assays*)		
Equipment	--	--
Supplies	7K	12K
Fee[a] 5%,, PWLF	4.85	
Total (before OH)	**101.85**	**85.5**

Notes on budget:

1) Funds for harlequin work in the past years have provided through USGS to the Pacific Wildlife Foundation (PWLF); a 5% fee is provided to PWLF.
2) Plan to sample harlequins at least 1 more time; in 2012 if 2011 results show no area difference; in 2013 if areas differ in 2011. Consideration of subsequent captures will depend on results obtained in 2011 and 2012 or 2013.
3) Plan to sample sea otters in 2012 (last done 2008). Consideration of subsequent captures will depend on results obtained in 2012.

References

Bodkin, J.L., J.A. Reed, and B.E. Ballachey. Sea otter use of intertidal habitats relative to the presence of lingering oil in western Prince William Sound. *Exxon Valdez* Restoration Project //0808. Draft Final Report. *In review.*

Bodkin, J.L., G.E. Esslinger, and B.E. Ballachey. 2010. Trends in sea otter population abundance in western Prince William Sound: Progress toward recovery following the 1989 *Exxon Valdez* oil spill. Exxon Valdez Restoration Project //0808. Draft Final Report. *Exxon Valdez* Restoration Office, Anchorage, AK. 112 pp.

Esler, D., K. A. Trust, B. E. Ballachey, S. A. Iverson , T. L. Lewis, D. J. Rizzolo, D. M. Mulcahy, A. K. Miles, B. R. Woodin, J. J. Stegeman, J. D. Henderson, and B. W. Wilson. 2010. Cytochrome P4501A biomarker indication of oil exposure in harlequin ducks up to 20 years after the Exxon Valdez oil spill. Environmental Toxicology and Chemistry 29:1138-1145.

Miles, A.K., L. Bowen, B. Ballachey, J.L. Bodkin, and J. Stott. *In preparation*. Gene expression and physiological pathology in sea otters (*Enhydra lutris*): Determination of Injury Two Decades Post Exxon Valdez. Draft Final Report, in preparation for the *Exxon Valdez* Restoration Office, Anchorage, AK.

Trust, K. A., D. Esler, B. R. Woodin, and J. J. Stegeman. 2000. Cytochrome P450 1A induction in sea ducks inhabiting nearshore areas of Prince William Sound, Alaska. Marine Pollution Bulletin 40:397-403.

APPENDIX 2. REFERENCES

Barry J. P., Baxter C. H., Sagarin R. D., and Gilman S. E. 1995. Climate-related, long-term faunal changes in a California rocky intertidal community. Science 267(5198): 672-675.

Bodkin, J.L., B.E. Ballachey, T.A. Dean, A.K. Fukuyama, S.C. Jewett, L.L. McDonald, D.H. Monson, C.E. O'Clair, and G.R. VanBlaricom. 2002. Sea otter population status and the process of recovery following the 1989 *Exxon Valdez* oil spill. Mar Ecol Prog Ser. 241:237-253.

Burnham, K.P. and D.R. Anderson. 2002. Model selection and multimodel inference. 2nd Ed. Springer-Verlag, New York.

Burnham, K.P. and D.R. Anderson. 2004. Multimodel inference: understanding AIC and BIC in model selection. Sociological Methods in Research 33:261-304.

Connell, J. H. 1972. Community interactions on marine rocky intertidal shores. Annual Review of Ecology and Systematics 3: 169-92.Dahlmann, G., D. Timm, C. Averbeck, C. J. Camphuysen, H. Skov, and J. Durinck. 1994. Oiled seabirds: comparative investigations on oiled seabirds and oiled beaches in The Netherlands, Denmark and Germany (1990-93). Marine Pollution Bulletin 28(5): 305-310.

Dayton P. K. 1971. Competition, disturbance and community organization: the provision and subsequent utilization of space in a rocky intertidal community. Ecol Monogr 41(4): 351-89.

Dean, T. and J.L. Bodkin. 2006. Sampling Protocol for the Nearshore Restoration and Ecosystem Monitoring (N-REM) Program (Nearshore Restoration and Ecosystem Monitoring Research Project G-050750), US Geological Survey, Alaska Science Center, Anchorage, Alaska. Report submitted to the EVOS Trustee Council. 99 pg. plus appendices.

Dean, T. A., and J. L. Bodkin. 2011. Protocol narrative for marine nearshore ecosystem monitoring in the Southwest Alaska Network of National Parks. Natural Resource Report NPS/SWAN/NRR. National Park Service, Fort Collins, Colorado.

Dean, T.A., J.L. Bodkin, H.A. Coletti and K.A. Kloecker. 2008. Nearshore Data Management and Monitoring Project. Draft final report, Exxon Valdez Trustee Council Restoration Project 070750, Anchorage, Alaska, 99501, 56pp. April 2008.

Estes, J. A., and D. O. Duggins. 1995. Sea Otters and Kelp Forests in Alaska: Generality and Variation in a Community Ecological Paradigm. Ecological Monographs. 65. (1.): 75-100.

EVOSTC. 2000. Gulf Ecosystem Monitoring: A sentinel monitoring program for the conservation of the natural resources of the northern Gulf of Alaska. GEM Science Program NRC review draft. *Exxon Valdez* Oil Spill Trustee Council. Anchorage, Alaska.

Irons, D.B., S.J. Kendall, W.P. Erickson, and L.L. McDonald. 2000. Nine years after the Exxon Valdez oil spill: effects on marine bird populations in Prince William sound, Alaska. Condor 102:723-737.

Jamieson, G. S., E. D. Grosholz, D. A. Armstrong , and R. W. Elner. 1998. Potential Ecological Implications from the Introduction of the European Green Crab, *Carcinus maenas*

(Linneaus), to British Columbia, Canada, and Washington, USA. Journal of Natural History 32(10-11): 1587-1598.

Lewis, J. 1996. Coastal benthos and global warming: strategies and problems. Marine Pollution Bulletin 32(10): 698-700.

Monson, D. H., D. F. Doak, B. E. Ballachey, A. Johnson, and J. L. Bodkin. 2000. Long-term impacts of the Exxon Valdez oil spill on sea otters, assessed through age-dependent mortality patterns. Proc. Natl. Acad. Sci. USA 97(12): 6562-6567.

Mundy, P.R, Editor. 2005. The Gulf of Alaska: Biology and Oceanography. Alaska Sea Grant College Program, Fairbanks, Alaska.

Murray, S. N., Denis T.G., J. S. Kido, and Smith J.R. 1999. Human visitation and the frequency and potential effects of collecting on rocky intertidal populations in southern California marine reserves. *In* Calif. Coop. Ocean. Fish. Invest. Report, 40, 100–106.

Paine, R. T. 1994. Marine rocky shores and community ecology: an experimentalist's perspective. Ecology Institute: Oldendorf/Luhe, Germany. pp.152.

Peterson, C. H. 1993. Improvement of environmental impact by application of principles derived from manipulative ecology: Lessons from coastal marine case histories. Australian Journal of Ecology 18: 21-52.

Peterson, C. H. 2001. The "Exxon Valdez" oil spill in Alaska: acute, indirect and chronic effects on the ecosystem. Advances in Marine Biology 39: 1-103.

Peterson, C. H., S. D. Rice, J. W. Short, D. Esler, J. L. Bodkin, B. E. Ballachey, and D. B. Irons. 2003. Long-term ecosystem response to the *Exxon Valdez* oil spill. Science 302: 2082-2086.

Sagarin R.D., Barry J.P., Gilman S.E., and Baxter C.H. 1999. Climate related changes in an intertidal community over short and long time scales. Ecological Monographs 69(4): 465-490.

Schiel, D. R., and Taylor D.I. 1999. Effects of trampling on a rocky intertidal algal assemblage in southern New Zealand. J. Exp. Mar. Biol. & Ecol. 235(2): 213-235.

Schoch, G.C., G.L. Eckert, and T.A. Dean. 2002. Long-term monitoring in the nearshore ocean: designing a program to detect change and determine cause, Exxon ValdezOil Spill Gulf Ecosystem Monitoring and Research Project Final Report (GEM Project 02395), Kachemak Bay Research Reserve, Homer, Alaska.

Short, J.W., M. R. Lindeberg, P. M. Harris, J. M. Maselko, J. J. Pela, and S. D. Rice. 2004. Estimate of oil persisting on the beaches of Prince William Sound 12 years after the *Exxon Valdez* oil spill. Environmental Science and Technology. 38(1):19-25.

Sousa, W. P. 1979. Experimental Investigations of Disturbance and Ecological Succession in a Rocky Intertidal Algal Community. Ecological Monographs. 49. (3.): 227-254.

APPENDIX 3:

CURRICULUM VITAS FOR PRINCIPAL INVESTIGATORS

A. Program Management and Science Coordination/ Synthesis

Molly McCammon – Alaska Ocean Observing System (Team Lead)
Nancy Bird – Prince William Sound Science Center (Administrative Lead)
Kris Holderied – NOAA Kasitsna Bay Laboratory (Science Lead and Env. Drivers)
Tuula Hollmen – Alaska Sea Life Center
Shane St Clair – Alaska Ocean Observing System (Data Management Lead)

B. Environmental Drivers Monitoring Component

Tom Weingartner – University of Alaska Fairbanks (Component Lead)
Sonia Batten – Sir Alister Hardy Foundation for Ocean Science
Rob Campbell – Prince William Sound Science Center
Angela Doroff – ADF&G Kachemak Bay Research Reserve
Russell Hopcroft – University of Alaska Fairbanks

C. Pelagic Monitoring Component

Jeep Rice – NOAA/NMFS Auke Bay Laboratory (Component Lead)
Mary Ann Bishop – Prince William Sound Science Center
David Irons – USFWS Alaska Region
Craig Matkin – North Gulf Oceanic Society
John Moran – NOAA/NMFS Auke Bay Laboratory
John Piatt – USGS Alaska Science Center

D. Benthic Monitoring Component

Brenda Ballachey – USGS Alaska Science Center (Component Lead)
James Bodkin – USGS Alaska Science Center
Heather Coletti – National Park Service, SW Alaska Inventory & Monitoring Network
Thomas Dean, Coastal Resources Associates, Inc
Brenda Konar – University of Alaska Fairbanks
Katrin Iken – University of Alaska Fairbanks

RESUME

BRENDA E. BALLACHEY

Research Physiologist
U.S. Geological Survey, Alaska Science Center
4210 University Drive
Anchorage, Alaska 99508
(403)288-9184
bballachey@usgs.gov or bballachey@shaw.ca

EDUCATION

Oregon State University, Corvallis, Oregon - Ph.D., 1985
Colorado State University, Fort Collins, Colorado - M.S., 1980
Colorado State University, Fort Collins, Colorado - B.S. with distinction, 1974

PROFESSIONAL EXPERIENCE

Research Physiologist
Alaska Biological Science Center, U.S. Geological Survey, Anchorage, AK
(Formerly National Biological Service; Fish & Wildlife Service)
July 1990 to present: *Research focus on the identification and understanding of chronic or long-term population and ecosystem level effects of contaminants in the nearshore marine environment, addressing species and ecosystems of high interest to the U.S. Department of the Interior as part of a multi-disciplinary team.*

General Biologist
Alaska Fish and Wildlife Research Center, U.S. Fish and Wildlife Service, Anchorage, AK
November 1989 to July 1990: *Research on sea otters, with emphasis on studies of acute and chronic effects of the Exxon Valdez oil spill on the sea otters.*

Staff Officer
Board on Agriculture, National Research Council (NRC), Washington, DC, USA
March 1987 to November 1989: *Worked with Committee on Managing Global Genetic Resources to assess genetic diversity in agricultural species, including crops, livestock, forests and fisheries. March 1987 to June 1989, hired by the US Department of Agriculture, assigned to the NRC. July to November 1989, consultant to the NRC.*

SELECTED PUBLICATIONS

Ballachey, B.E., J. L. Bodkin, and A. R. DeGange. 1994. An Overview of Sea Otter Studies. Chapter 3 in Marine Mammals and the *Exxon Valdez*. T.R. Loughlin, Ed. Academic Press.

Ballachey, B.E., J.L. Bodkin, S. Howlin, A.M. Doroff and A.H. Rebar. 2003. Survival of juvenile sea otters in Prince William Sound, Alaska, 1992-93. Cdn. Jnl. Zoology

Bodkin, J.L. and B.E. Ballachey. 1996. Monitoring the status of the wild sea otter population: field studies and techniques. Endangered Species Update 13(12):14-19.

Bodkin, J.L. and B.E. Ballachey. 2010. Modeling the effects of mortality on sea otter populations. Scientific Investigations Report 2010-5096. U.S. Geological Survey. 12 p.

Bodkin, J.L., B.E. Ballachey, T.A. Dean, S. Jewett, L. McDonald, D. Monson, C. O'Clair, and G. VanBlaricom. 2002. Recovery of sea otters in Prince William Sound following the *Exxon Valdez* oil spill. Mar. Ecol. Prog. Ser. 241:237-253.

Esler, D., B.E. Ballachey, K.A. Trust, S.A. Iverson, J.A. Reed, A.K. Miles, J.D. Henderson, B.W. Wilson, B.R. Woodin, J.J. Stegeman, M. McAdie, and D.M. Mulcahy. 2011. Cytochrome P4501A biomarker indication of the timeline of chronic exposure of Barrow's Goldeneyes to residual *Exxon Valdez* oil. *In Press*: Mar. Poll. Bull.

Esler, D., T.D. Bowman, K.A. Trust, B.E.Ballachey, T.A. Dean, S.C. Jewett and C.E. O'Clair. 2002. Harlequin duck population recovery following the *Exxon Valdez* oil spill: progress, process and constraints. Mar. Ecol. Prog. Ser. 241:271-286.

Esler, D., K.A. Trust, B.E. Ballachey, S.A. Iverson, T.L. Lewis, D.J. Rizzolo, D.M. Mulcahy, A.K. Miles, B.R. Woodin, J.J. Stegeman, J.D. Henderson, and B.W. Wilson. 2010. Cytochrome P4501A biomarker indication of oil exposure in harlequin ducks up to 20 years after the *Exxon Valdez* oil spill. Environ Toxicol Chem 29(5):1138-1145.

Lannan, J.E., G.A.E. Gall, J.E. Thorpe, C.E. Nash, and B.E. Ballachey. 1989. Genetic resource management of fish. Genome 31(2):798-804.

Larson, S.D., D. Monson, B.E. Ballachey, R. Jameson, and S.K. Wasser. 2008. Stress-related hormones and genetic diversity in sea otters (*Enhydra lutris).* Mar Mamm Sci 25(2):351-372.

Lipscomb, T.P., R.K. Harris, R.B. Moeller, J.M. Pletcher, R.J. Haebler and B.E. Ballachey. 1993. Histopathologic lesions in sea otters exposed to crude oil. Vet. Path. 30:1-11.

Lipscomb, T.P., R.K. Harris, A.H. Rebar, B.E. Ballachey and R.J. Haebler. 1994. Pathology of Sea Otters. Chapter16 in Marine Mammals and the *Exxon Valdez*. T.R. Loughlin, Ed. Academic Press.

Loughlin, T.R., B.E. Ballachey and B. Wright. 1996. Overview of studies to determine injury caused by the *Exxon Valdez* oil spill to marine mammals. *In* Rice, S.D., R.B. Spies, D.A. Wolfe and B.A. Wright, Eds. Proceedings of the *Exxon Valdez* Oil Spill Symposium. American Fisheries Society Symposium Number 18:798-808.

Monson, D.H., D.F. Doak, B.E. Ballachey, and J.L. Bodkin. In review. Could residual oil from the *Exxon Valdez* spill create a long-term population "*sink"*for sea otters in Alaska? *Submitted to:* Ecolog Applic, January 2011.

Monson, D.H., D.F. Doak, B.E. Ballachey, A. Johnson and J.L. Bodkin. 2000. Long-term impacts of the *Exxon Valdez* oil spill on sea otters assessed through age-dependent mortality patterns. Proc. Natl. Acad. Sci., USA 97:6562-6567.

Monson, D.H., C. McCormick and B.E. Ballachey. 2001. Chemical anesthesia of northern sea otters: results of past field studies. J. Zoo Wild. Med. 32:181-189.

Mulcahy, D.M and B.E. Ballachey. 1994. Hydrocarbon residues in sea otters. Chapter 18 in Marine mammals and the *Exxon Valdez*. T.R. Loughlin, Ed. Academic Press.

Peterson, C.H., S.D. Rice, J.W. Short, D. Esler, J.L. Bodkin, B.E. Ballachey, and D.B. Irons. 2003. Long-term ecosystem response to the Exxon Valdez oil spill. Science 302:2082-2086.

Ricca, M.A., A.K. Miles, B.E. Ballachey, J.L. Bodkin, D.E. Esler, and K.A. Trust. 2010. PCB exposure in sea otters and harlequin ducks in relation to history of contamination by the *Exxon Valdez* oil spill. Mar Poll Bull 60(6):861-872.

Rebar, A.H., T.P. Lipscomb, R.K. Harris and B.E. Ballachey. 1995. Clinical and clinical laboratory correlates in sea otters dying acutely in rehabilitation centers. Vet. Clin. Path. 32:346-350.

Resume: Sonia Dawn Batten Ph.D.

Sir Alister Hardy Foundation for Ocean Science
C/o 4737 Vista View Crescent
Nanaimo, British Columbia, V9V 1N8, Canada
Tel/FAX: 1-250-756-7747
Email: soba@sahfos.ac.uk

Qualifications

1990–1994. PhD. Marine Biology. 'Correlative studies of the ecophysiology and community structure of benthic macrofauna' Southampton University, UK.
1987–1990. BSc. Honours Degree in Oceanography with Biology, 2(i). Southampton University, UK

Career History

2000 to present. Half-time Research Fellow. Sir Alister Hardy Foundation for Ocean Science, UK.
2003 and 2004. Temporary Instructor, Malaspina University College, Fisheries and Aquaculture program.
1996–2000. Assistant Director. Sir Alister Hardy Foundation for Ocean Science, UK
1994–1996. Postdoctoral Research Fellow. Sir Alister Hardy Foundation for Ocean Science, UK

During the past 16 years I have been working with the Continuous Plankton Recorder Survey through the Sir Alister Hardy Foundation for Ocean Science, which operates and maintains the multi-decadal, basin-wide database of plankton abundance and distribution from the North Atlantic. Since 2000 I have been based in western Canada, co-ordinating the north Pacific CPR survey. My main research focus has been the mesozooplankton; their distribution, ecology and role in the upper pelagic ecosystem. I have extensive experience of analysing and interpreting CPR data and have worked on several multidisciplinary projects in European waters. I have extensive project management, data analysis and publication/presentation skills through my experience as Assistant Director of SAHFOS and as acting as a PI on numerous research projects (including the current EVOS and NPRB projects in the North Pacific).

Five Recent Relevant Publications

Sonia D. Batten and Peter H. Burkill (2010) *The Continuous Plankton Recorder: towards a global perspective*. Journal of Plankton Research 2010 32: 1619-1621
Batten, S.D., and Mackas, D.L. (2009) Shortened duration of the annual *Neocalanus plumchrus* biomass peak in the Northeast Pacific. Marine Ecology Progress Series. 393, 189-198.
Mackas, D.L., Batten, S.D., and Trudel, M., (2007) Effects on zooplankton of a warming ocean: recent evidence from the Northeast Pacific. Progress in Oceanography, 75, 223-252
Batten, S.D. and Freeland, H.J. (2007). Plankton populations at the bifurcation of the North Pacific Current. Fisheries Oceanography, 16, 536-646.

Batten, S.D and Crawford, W.R. (2005). The influence of coastal origin eddies on oceanic plankton distributions in the eastern Gulf of Alaska. Deep Sea Research II, 52, 991-1009.

Other Significant Publications

Batten, S.D. and Welch, D.W. (2004). Changes in oceanic zooplankton populations in the North-east Pacific associated with the possible climatic regime shift of 1998/1999. Deep Sea Research II, **51**, 863-873.

Batten, S.D., Clarke, R.A., Flinkman, J., Hays, G.C., John, E.H., John, A.W.G., Jonas, T.J., Lindley, J.A., Stevens, D.P., and Walne, A.W. (2003). CPR sampling – The technical background, materials and methods, consistency and comparability. *Progress in Oceanography*, **58**, 193-215.

Main collaborators on projects/publications in last 4 years

Peter Burkill, SAHFOS
Richard Kirby, Marine Biological Association, UK
Alistair Lindley, SAHFOS
David Mackas, Department of Fisheries and Oceans, Canada
William Sydeman, Farallones Institute
Marc Trudel, Department of Fisheries and Oceans, Canada
Anthony Walne, SAHFOS
David Welch, Kintama Research Services, Canada

Prince William Sound
Science Center
P.O. Box 705
Cordova, Alaska 99574

Phone 907-424-5800 x 225
Fax 907-424-5820
nbird@pwssc.org

Nancy A. Bird

Professional experience

2003 - present Oil Spill Recovery Institute Cordova, Alaska

Director

Administrator of a nearly one million dollar annual grant program supporting oil pollution research and education projects focused on the Arctic and sub-Arctic marine environment. Supervise support staff implementing grant solicitations and contracts. Communicate regularly with the OSRI Advisory Board. Work to develop partnerships and collaborations with other science and oil pollution research related institutions.

2003 – present Prince William Sound Science Center Cordova, Alaska

Chief Executive Officer & President

Chief executive of a non-profit organization dedicated to improving our understanding and knowledge about the ecosystems in and surrounding Prince William Sound. Annual budget of the organization averages $3 million. Currently supervise a 24-person staff including seven Ph.D.-level researchers, five educators and five administrative support staff. Work closely with the Board of Directors to develop policies and strategic plans. Manage and prepare budgets. Develop and implement fundraising strategies for both individual projects and discretionary use. Promote partnerships and collaborations with other science and educational institutions.

1994 – 2002 Prince William Sound Science Center Cordova, Alaska

Vice President

Responsible for day-to-day operations of a non-profit research and education organization, including personnel, building maintenance and general scheduling. Administrative support and record keeping for two Boards of Directors. Assistant to the President. Supervisor for Education program staff and oversee all education programs. Coordinator for various fundraising events and educational and scientific workshops.

1989 – 1994 Prince William Sound Science Center Cordova, Alaska

Public Affairs and Administrative Coordinator

Preparation of news releases, brochures and other public relations materials. Correspondence, filing and assistant to the Board of Directors and President. Logistics Coordinator for three major scientific conferences held in Cordova in 1990, 1991 and 1992

April – September 1989 City of Cordova Cordova, Alaska

Editor, Cordova Fact Sheet

Editor of a daily (seven days per week) 4-page newsletter published from April 14, 1989 forward as an information source for residents on events surrounding the Exxon Valdez oil spill.

1988 Cordova Historical Museum Cordova, Alaska

Assistant for Collections

Organized photo collections and assisted Director with miscellaneous duties.

1986 – 1988 and 1981-83 The Cordova Times Cordova, Alaska

Editor and photographer

Responsible for reporting, editing and compilation of a weekly 16-24 page community newspaper. News and feature stories, editorials and photos. Substitute advertising salesperson.

1983 - 1989

Freelance writer and photographer

Focused on fishing and Alaskan history issues. Published in the Alaska Fisherman's Journal, Fairbanks Daily News-Miner, The Cordova Times, Alaska Magazine and the Valdez Vanguard.

1986 Cordova Chamber of Commerce Cordova, Alaska

Administrative Coordinator

Responded to visitor inquiries via mail, phone and in-person. Organized weekly luncheon programs. Coordinated fundraising efforts through direct mail and events. Staff assistant to Board of Directors.

1980 – 1988 Prince William Sound Community College Cordova, Alaska

History and Political Science Instructor

Developed and taught five courses on the histories of Alaska, Prince William Sound, Modern India, the Middle East and the Alaska Legislature.

Additional positions held

General assistant, p/t Cordova District Fishermen United, Cordova 1986
Cook and deckhand F/V Dancing Bear, Prince William Sound, 1985
Typsetter and paste-up artist The Type Shop, Anchorage, 1983-1985
Teacher's aide/Special Education Cordova School District, Cordova1980
Bob Korn Swimming Pool Manager City of Cordova, 1979-1980
Recreation Director Eyak Youth Services Center, Cordova 1976-1979

Education

Bachelor of Arts/History 1975, Carleton College, Northfield, Minn.

- Received with distinction in Asian Indian History
- Class of 1975 Community Service Award

Publications

The Rain Forests of Home.1997. Island Press, Washington, D.C. Edited by Peter K. Schoonmaker, Bettina von Hagen, and Edward C. Wolf. Chapter 7 subsection on "The Prince William Sound Science Center", by Nancy Bird. Pages 209-212.

Cordova to Kennecott. 1988. Cordova Historical Society re-publication coordinated by Nancy Bird with new preface authored by Bird. Pages 19-21.

Additional professional activities

Board Member (current), Alaska Ocean Observing System
Board Member (current), North Pacific Research Board
Past Member (2004-2010), Prince William Sound Regional Citizens' Advisory Council
Past representative (2000), Prince William Sound Aquaculture Corporation
Cordova City Council member, 2000-2004 and 1990-1993
Acting Mayor, City of Cordova – December 2002-March 2003

Professional memberships

Alaska Historical Society

Cordova History Society

Community activities

KCHU public radio Board of Directors member, 2000 – 2002

Cordova Iceworm Festival Parade Coordinator, 1999-2002

Resume

James L. Bodkin
Project Leader, Research Wildlife Biologist
U.S. Geological Survey, Alaska Science Center
616 Marrowatone Pt. Rd, Nordland, WA 98568
Phone: 907 748 4367
Fax: 360 390 5611
E-mail: James_Bodkin@usgs.gov

Education
1985 - MS, California Polytechnic State University, San Luis Obispo, CA. (Wildlife Biology)
1976 - BS, Long Beach State University (Biology), Long Beach, CA

Current Activities
I lead the Alaska sea otter research project and the coastal ecosystems team of the Alaska Science Center, US Geological Survey. Research is organized into three programs: 1) Sea otter population assessment, 2) Processes structuring coastal ecosystems and, 3) Effects and status of recovery of the nearshore ecosystem from the 1989 Exxon Valdez oil spill in Prince William Sound. Each of these programs consists of several independent research projects. I supervise and manage all activities associated with this complex and diverse array of research projects internal to the Alaska Science Center and collaborate with at least 14 agencies, academic or private institutions on cooperative, multi-disciplinary projects. I lead a scientific team of six, and manage annual budgets of about $800,000 that include USGS and cyclic funds. I also lead the Coastal Marine Ecosystem Team, a multi-disciplinary research effort investigating coastal ecosystems in the North Pacific. Coastal Marine Ecosystem Team research programs, in addition to sea otters include; benthic habitat classification, biological and physical oceanography, seabirds and other marine mammals, marine invertebrates, and marine fishes.

Selected Recent Publications
Bodkin, J.L., and B.E. Ballachey. 2010. Modeling the effects of mortality on sea otter populations. USGS Scientific Investigation Report 2010-5096. 12p.

Estes, J.A. M.T. Tinker, and J.L. Bodkin. 2009. Using ecological function to develop recovery criteria for depleted species: Sea otters and kelp forests in the Aleutian Archipelago. Conservation Biology 24(3):852-860.

Bodkin, J.L., D.H. Monson, and G.G. Esslinger. 2007. Population status and activity budgets derived from time-depth recorders in a diving mammal. J. Wildlife Management 71(6):2034-2044.

Estes, J.A., J.L. Bodkin, and M Ben-David. 2008. Marine Otters. In W.F. Perrin, B. Wursig,, J.G.M. Thewissen and C.R. Crumly (eds) Encyclopedia of Marine Mammals, 2nd Edition. Academic Press.

Iverson, S.J., A.M. Springer, and J.L. Bodkin 2007. Strategies for survival: Marine Mammals. Pages 114-131, *in* Robert Spies (ed.). Long term ecosystem change in the northern Gulf of Alaska. Elsevier, Amsterdam, the Netherlands.

Springer, A.S., S. J. Iverson and J.L. Bodkin. 2007. Marine Mammal Populations. Page 352-375, *in* Robert Spies (ed.). Long term ecosystem change in the northern Gulf of Alaska. Elsevier, Amsterdam, the Netherlands.

Laidre, K.L., J. A. Estes, M. T. Tinker, J. Bodkin, D. Monson, and K. Schneider. 2006. Patterns of growth and body condition in sea otters from the Aleutian archipelago before and after the recent population decline. J. Animal Ecology 75:978-989.

Tinker, T.M., D.F. Doak, J.A. Estes, B.H. Hatfield, M.M. Staedler, J.L. Bodkin. 2006. Incorporating diverse data and realistic complexity into demographic estimation procedures: a case study using the California sea otter, *Enhydra lutris nereis*. Ecological Applications 16(6):2293-2312.

Lowry, L.L. and J.L. Bodkin. 2005. Marine Mammals, in. Phillip R. Mundy (ed.). The Gulf of Alaska: Biology and Oceanography. Alaska Sea Grant College Program, University of Alaska Fairbanks. pp 99-116.

Bodkin, J.L., G.G. Esslinger and D.H. Monson. 2004. Foraging depths of sea otters and implications to coastal marine communities. Marine Mammal Science 20(2):305-321.

Peterson, C.H., S.D. Rice, J.W. Short, D. Esler, J.L. Bodkin, B.E. Ballachey, D.B. Irons. 2003. Long-term ecosystem response to the Exxon Valdez oil spill. Science 302:2082-2086.

Ballachey, B.E., J.L. Bodkin, S. Howlin, A.M. Doroff, and A.H. Rebar. 2003. Correlates to survival of juvenile sea otters in Prince William Sound, Alaska. Canadian J. Zoology 81:1494-1510.

Bodkin, J.L. 2003. Sea Otter. Pages 735-743, in Feldham. G. A., B.C. Thompson, and J.A. Chapman (eds), Wild Mammals of North America, 2nd edition. Johns Hopkins University Press, Baltimore. 735-743

Bodkin, J.L., B.E. Ballachey, T.A. Dean, A.K. Fukuyama, S.C. Jewett, L.M. McDonald, D.H.Monson, C.E. O'Clair and G.R. VanBlaricom. 2002. Sea otter population status and the process of recovery from the Exxon Valdez oil spill. Marine Ecology Progress Series. 241:237-253.

Collaborators

Ballachey, Brenda, (Alaska Science Center), Burn, Douglas, (US Fish and Wildlife Service), Dean, Thomas, (Coastal Resources Associates), Esler, Dan, (Simon Fraser University), Estes, James, (University of California, Santa Cruz), Howlin, Shay, (West Ecosystems Technology, Cheyenne, WY), Irons, David, (US Fish and Wildlife Service), Miles, Keith USGS WERC), Staedler, Michelle, (Monterey Bay Aquarium), Tinker, Tim, USGS WERC)

Robert William Campbell
Prince William Sound Science Center
P.O. Box 705, Cordova, AK, 99574
rcampbell@pwssc.org
(907)424-5800

EDUCATION

Doctor of Philosophy, University of Victoria, School of Earth and Ocean Sciences (1999-2003)
Thesis: "Overwintering ecology of Neocalanus plumchrus"
Master of Science, Biology, Dalhousie University (1996-1998)
Thesis: "Reproduction of Calanus finmarchicus in the western North Atlantic: fecundity and hatching success"
Bachelor of Science (Hons), Biology, University of Toronto (1991-1996)
Thesis: "Simulation and bioenergetic modeling of Walleye (Stizostedion v. vitreum) populations"

APPOINTMENTS

2007 – present	Oceanographer, Prince William Sound Science Center
2010 – present	Affiliate faculty, University of Alaska Anchorage
2004-2006	Post-doctoral researcher, University of Hamburg, Germany

RECENT PUBLICATIONS

Diekmann, A.B.S., Holste, L., St. John, M., Peck, M and R.W. Campbell. 2009.Variation in diatom biochemical composition during a simulated bloom and its effect on copepod reproduction. J. Plankton Res. 31:1391-1405

Campbell, R.W. 2008. Overwintering habitat of Calanus finmarchicus in the North Atlantic inferred from autonomous profiling floats. Deep Sea Res. 55:630-645.

Campbell, R.W and J.F. Dower. 2008. Life history and depth distribution of Neocalanus plumchrus in the Strait of Georgia. J. Plankton Res. 30:7-20.

Kattner, G., Hagen, W., Lee, R.F., Campbell, R.W., Deibel, D., Falk-Petersen, S., Graeve, M., Hansen, B.W., Hirche, H.J., Jonasdottir, S.H., Madsen, M.L., Mayzaud, P., Müller-Navarra, D., Nichols, P., Paffenhöffer, G.A., Pond, D., Saito, H., Stübing, D., and P. Virtue. 2007. Perspectives on zooplankton lipids. Can. J. Fish. Aquat. Sci. 64:1628-1639.

Campbell, R.W., Boutillier, P. and J.F. Dower. 2004. Ecophysiology of overwintering in the copepod Neocalanus plumchrus: Changes in lipid and protein contents over a seasonal cycle. Mar. Ecol. Prog. Ser. 280:211-226.

Campbell, R.W. 2004. Comments on "Some ideas about the role of lipids in the life cycle of Calanus finmarchicus ". J. Plankton Res. 26:979-980.

Campbell, R.W. and J.F. Dower. 2003. The role of lipids in the regulation of buoyancy by zooplankton. Mar. Ecol. Prog. Ser. 263:93-99.

Irigoien, X., Harris, R.P., Verheye, H.M., Joly, P., Runge, J.A., Starr, M. Pond, D., Campbell, R.W., Shreeve, R., Ward, P., Smith, A.N., Dam, H.G., Napp, J., Peterson, W., Tirelli, V., Koski, M., Smith, T., Harbour, D., Strom, S. and R. Davidson. 2002. Copepod Hatching Success Rate in Marine Ecosystems With with High Diatom Concentrations - the Paradox of Diatom-Copepod Interactions Revisited. Nature. 419:387-389.

SELECTED PRESENTATIONS

Campbell, R.W., Schroth, A. And J. Crusius. 2010. Seasonal changes in productivity in the Copper River plume and coastal Gulf of Alaska. AGU Fall Meeting, San Francisco.

Campbell, R.W. 2010. Overwintering habitat of Calanus finmarchicus in the North Atlantic inferred from autonomous profiling floats. ASLO Ocean Sciences meeting, Portland.

Campbell, R.W., Chai, F. and Y. Chao. 2009. An empirical test of an NPZ model during the 2009 AOOS observing system experiment. Eastern Pacific Oceanography Conference, Sidney

Campbell, R.W., Siwicke, K., Gates, H.R., Lindsley, A.J. and T. Kline. 2008. Plankton distributions in Prince William Sound and the Coastal Gulf of Alaska, 2007. Alaska Marine Science Symposium.

Campbell, R.W. Nielsen, M.H. and K. Möller. 2007. Mesoscale distributions of plankton in the North Sea in relation to fronts. ICES/PICES Early Career Scientists Conference, Baltimore.

Campbell, R.W. Nielsen, M.H. and K. Möller. 2007. Meso- to small-scale distributions of plankton and marine snow in the southeastern North Sea in relation to fronts. ICES/PICES/GLOBEC 4th Zooplankton Production Symposium, Hiroshima.

Campbell, R.W., Nielsen, M.H. and A. Temming. 2006. Mesoscale plankton distributions across a tidal front in the Southeastern North Sea [poster]. ASLO/AGU/TOS Ocean Sciences Meeting, Honolulu.

Campbell, R.W. 2005. The ups and downs of a copepod: Vertical distributions of Neocalanus plumchrus in the Strait of Georgia [poster]. ASLO Summer Meeting, Santiago de Compostela.

Professional Society Membership/Professional Service

Member, American Society of Limnology and Oceanography (1998-present)

2007-present: Member-at-large, Education and Human Resource Image Library Subcommittee

Member, International Council for the Exploration of the Sea

Member, Exxon Valdez Trustee Council Integrated Herring Restoration Plan Working Group.

Proposal Reviewer: NPRB, National Science Foundation, Deutsche Forschungsgemeinschaft.

Report Reviewer: Exxon Valdez Trustee Council

Manuscript Reviewer, Canadian Journal of Fisheries and Aquatic Sciences, ICES Journal of Marine Science, Journal of Marine Systems, Journal of Plankton Research, Marine Biology, Marine Ecology Progress Series, Progress in Oceanography

Current Activities Relevant to the Proposed Project

1. EVOSTC project ("PWS herring survey: Plankton and oceanographic observations") to conduct regular surveys of hydrography, plankton and nutrients in the Prince William Sound area.
2. AOOS project ("Prince William Sound Observing System") to implement an ocean observing system in the Prince William Sound area, including biophysical moorings with near real-time satellite telemetry.
3. NSF/NOPP project (with WETlabs) to field test CYCLE-PO4, an in-situ phosphate analysis system in Prince William Sound and Lake Eyak.
4. USGS project ("Impacts of climate change and melting glaciers on coastal ecosystems in the nearshore waters of the Gulf of Alaska") to conduct regular oceanographic transects from the mouth of the Copper River into the Gulf of Alaska.
5. NASA project ("Melting ice, habitat change and nutrient flux: Hydrological, biogeochemical and biological linkages between the Copper River watershed and the coastal Gulf of Alaska") to conduct spatial mapping of the Copper River plume (remote sensing with ground-truth samples), and to identify and quantify the importance of aerosol fluxes of iron from the coast to the Gulf of Alaska.

RESUME

Heather A. Coletti
Marine Ecologist
National Park Service
240 W 5th Avenue, Anchorage, Alaska 99501, USA
Phone: 907-644-3687
E-mail: Heather_Coletti@nps.gov

Areas of Expertise
General ecology of nearshore marine ecosystems
Sea otter ecology
GIS (Geographical Information Systems) for designing surveys of various types as well as for more complex spatial analysis of data to determine habitat use and potential species densities

Education
University of New Hampshire, Durham, New Hampshire – M.S., 2006
Major: Natural Resources: Environmental Conservation
University of Rhode Island, Kingston, Rhode Island - B.S., 1997
Major: Zoology

Professional Experience (2001 to present)
Marine Ecologist, 2008 - present
National Park Service, Anchorage, AK
General Biologist, January 2002 to July 2008
U.S. Geological Survey – Alaska Science Center, Anchorage, AK
Biological Technician, October 2001 to January 2002
US Fish and Wildlife Service, Anchorage, AK
General Biologist, May 2001 to October 2001
U.S. Geological Survey – Alaska Science Center, Anchorage, AK

Collaborations
USGS, USFWS, NPS

Affiliations
Society for Marine Mammalogy

Selected Publications
Coletti, H., J. Bodkin, T. Dean, and K. Kloecker. 2010. Nearshore Marine Vital Signs Monitoring in the Southwest Alaska Network of National Parks. Natural Resource Technical Report.

Coletti, H., J. Bodkin, T. Dean, and K. Kloecker. 2009. Nearshore Marine Vital Signs Monitoring in the Southwest Alaska Network of National Parks. Natural Resource Technical Report.

Coletti, H. 2006. Correlating sea otter density and behavior to habitat attributes in Prince William Sound, Alaska: A model for prediction. MS Thesis, University of New Hampshire, Durham, NH. pp. 99.

Bodkin, J. L., T. A. Dean, H. A. Coletti, and K. A. Kloecker. 2008. Nearshore Marine Monitoring in the Southwest Alaska Network of National Parks. National Park Service. Anchorage, AK. 176 pg. In Review.

Bodkin, J. L., T. A. Dean, and H. A. Coletti. 2007. Nearshore Marine Monitoring in the Southwest Alaska Network of National Parks. National Park Service. Anchorage, AK. 102 pg.

Bodkin, J. L., B. E. Ballachey, G. G. Esslinger, K. A. Kloecker, D. H. Monson, and H. A. Coletti. 2007. Perspectives of an invading predator: Sea otters in Glacier Bay. Pp.133-136 in J. F. Piatt and S. M. Gende (eds.), Proceedings of the Fourth Glacier Bay Science Symposium. U.S. Geological Survey Scientific Investigations Report 2007-5047, 246 p.

Bodkin, J. L., B. E. Ballachey, K. A. Kloecker, G. G. Esslinger, D. H. Monson, and H. A. Coletti. 2005. Sea otter studies in Glacier Bay National Park and Preserve. 2004 Annual Report. USGS Alaska Science Center, Anchorage, AK.

Bodkin, J. L., B. E. Ballachey, K. A. Kloecker, G. G. Esslinger, D. H. Monson, H. A. Coletti, and J. A. Estes. 2004. Sea otter studies in Glacier Bay National Park and Preserve. 2003 Annual Report. USGS Alaska Science Center, Anchorage, AK.

Bodkin, J. L., K. A. Kloecker, G. G. Esslinger, D. H. Monson, H. A. Coletti, and J. Doherty. 2003. Sea otter studies in Glacier Bay National Park and Preserve. 2002 Annual Report. USGS Alaska Science Center, Anchorage, AK.

Bodkin, J. L., K. A. Kloecker, H. A. Coletti, G. G. Esslinger, D. H. Monson, and B. E. Ballachey. 2002. Marine Predator Surveys in Glacier Bay National Park and Preserve. Annual Report to USNPS. USGS Alaska Science, Anchorage, AK.

Bodkin, J. L., K. A. Kloecker, H. A. Coletti, G. G. Esslinger, D. H. Monson, and B. E. Ballachey. 2001. Marine Predator Surveys in Glacier Bay National Park and Preserve. Annual Report to USNPS. USGS Alaska Science, Anchorage, AK.

Resume

Thomas A. Dean, Ph. D.

Coastal Resources Associates Inc.
5190 El Arbol Dr.
Carlsbad, CA 92008

Phone: (760) 721-2798
Email: tomdean@coastalresources.us

–

Education

University of Delaware, Ph.D., Biology	1977
East Carolina University, M.A., Biology	1973
Gettysburg College, B.A., Biology	1970

Professional Experience

President Coastal Resources Associates, Inc.	1988 to Present
Associate Research Biologist University of California, Santa Barbara	1978 to 1987
Senior Staff Ecologist E.H. Richardson Associates	1976 to 1978

Representative projects

Principal Investigator – Development and Implementation of marine nearshore monitoring in National Parks of the Southwest Alaska Network. National Park Service - Anchorage

Principal Investigator – Monitoring in the nearshore Gulf of Alaska as part of the Gulf Ecosystem Monitoring Project: A process for making reasoned decisions. *Exxon Valdez* Oil Spill Trustee Council

Principal Investigator - Potential injury and recovery of nearshore vertebrate predators in Prince William Sound, Alaska. *Exxon Valdez* Oil Spill Trustee Council

Project Director – The San Clemente artificial reef project: Transplantation of giant kelp onto experimental reefs for the purposes of kelp enhancement. Southern California Edison Co.

Selected **Publications**

Bowyer, R.T., G.M. Blundell, M. Ben-David, S.C. Jewett, T.A. Dean, L.A. Duffy. 2003. Effects of the *Exxon Valdez* oil spill on river otters: injury and recovery of a sentinel species. Wildlife Monographs 67:1-53.

Dean, T.A., J.L. Bodkin, A. Fukuyama, S.C. Jewett, D.H. Monson, C.E. O'Clair, G.R. VanBlaricom. 2002. Food limitation and the recovery of sea otters following the *Exxon Valdez* oil spill. Marine Ecology Progress Series 241:255-270

Deysher, L.E., T.A. Dean, R. Grove, A. Jahn. 2002. Design considerations for an artificial reef to grow giant kelp (*Macrocystis pyrifera*) in Southern California. ICES J. Mar Sci. 217:17-24

Bodkin, J.L., B. Ballachey, T.A. Dean, F.K. Fukuyama, S.C. Jewett, L.L. McDonald, D.H. Monson, C.E. O'Clair, and G.R. Van Blaricom. 2002. Sea otter population status and the process of recovery following the 1989 *Exxon Valdez* oil spill. Marine Ecology Progress Series 241:237-253

Golet, H.G., P.E. Seizer, A.D. McGuire, D.D. Roby, J.B. Fischer, K.J. Kuletz. D.B. Irons, T. A. Dean, S.C. Jewett, and S.H. Newman. 2002. Long-term direct and indirect effects of the the *Exxon Valdez* oil spill on pigeon guillemots in Prince William Sound, Alaska. Marine Ecology Progress Series 241:287-304

Esler, D., T.D. Bowman, K.A. Trust, B.E. Ballachey, T.A. Dean, S.C. Jewett, C.E. O'Clair. 2002. Harlequin duck population recovery following the *Exxon Valdez* oil spill: Progress, process, and constraints. Marine Ecology Progress Series 241: 271-286

Jewett, S.C., T.A. Dean, B.R. Woodin, M.K. Hoberg, and J.L. Stegeman. 2002. Exposure to hydrocarbons ten years after the *Exxon Valdez* oil spill: evidence from cytochrome P4501A expression and biliary FACs in nearshore demersal fishes. Marine Environmental Research. 54:21-48.

Dean, T.A., S.C. Jewett. 2001. Habitat specific recovery of shallow subtidal communities following the *Exxon Valdez* oil spill. Ecological Applications 11:1456-1471.

Esler D., T.D. Bowman, C.E. O'Clair, T.A. Dean, L.L. McDonald. 2000. Densities of Barrow's Goldeneyes during winter in Prince William Sound, Alaska, in relation to habitat, food, and history of oil contamination. Water Birds 23:423-429

Esler, D., T.D. Bowman, T.A. Dean, C.E. O'Clair, S.C. Jewett, L.L. McDonald. 2000. Correlates of harlequin duck densities during winter in Prince William Sound, Alaska: Condor 102:920-926

Dean T.A., J.L. Bodkin, S.C. Jewett, D.H. Monson, D. Jung. 2000. Changes in sea urchins and kelp following reduction in sea otter density as a result of the *Exxon Valdez* oil spill. Marine Ecology Progress Series 199:281-291

Dean T.A., L. Haldorson, D.R. Laur, S.C. Jewett, A. Blanchard. 2000. The distribution of nearshore fishes in kelp and eelgrass communities in Prince William Sound, Alaska: associations with vegetation and physical habitat characteristics. Environmental Biology of Fishes 57: 271-287

Jewett, S.C., T.A. Dean, R.O. Smith, A. Blanchard. 1999. The *Exxon Valdez* oil spill: Impacts and recovery in the soft-bottom benthic community in and adjacent to eelgrass beds. Mar Ecol Prog Ser 185:59-83

Dean, T.A., K. Thies, S. Lagos. 1989. Survival of juvenile giant kelp: The effects of demographic factors, competitors, and grazers. Ecology 70:483-495

Dean, T.A., F. Jacobsen, K. Thies, S. Lagos. 1988. Differential effects of grazing by white sea urchins on recruitment of brown algae. Mar Ecol. Prog. Series 48:99-102

Dean, T.A., F. R. Jacobsen. 1986. Nutrient-limited growth of juvenile kelp, *Macrocystis pyrifera* during the 1982-1984 "El Nino" in southern California. Mar. Biol. 90:597-601

Dean, T.A. 1985. The temporal and spatial distribution of underwater quantum irradiation in a southern California kelp forest. Estuar. Coast. Shelf Sci. 21:835-601

Dean, T.A., S. Schroeter, J. Dixon. 1984. Effects of grazing by two species of sea urchins (*Strongylocentrotus franciscanus* and *Lytechinus anamesus*) on recruitment and survival of two species of kelp (*Macrocystis pyrifera* and *Pterygophora californica*). Mar. Biol. 78: 301-313

<u>Selected Organizations and Advisory Positions</u>

Past Member and past chair - Exxon Valdez Trustee Council science advisory panel

Advisor to the State of California Water Resources Control Board. Assessment and protocol selection for marine toxicity tests.

Advisor to the State of California Water Resources Board. Scientific Review Committee for the Marine Bioassay Project.

Reviewer for Ecological Applications, Marine Ecology Progress Series, Marine Biology, Botanica Marina, and other scientific journals.

Curriculum Vitae

Angela M. Doroff
Phone: Work (907) 226-4654
Email: angela.doroff@alaska.gov

Education:

Master of Science Degree - Wildlife Ecology
University of Wisconsin, Madison.

Bachelor of Science Degree - Biology
University of Minnesota, Minneapolis.

Current Employment:
Research Coordinator (2008-present), Kachemak Bay Research Reserve, 95 Sterling Hwy Suite 2 Homer, AK 99603,

The Kachemak Bay Research Reserve (KBRR) is housed within National Estuarine Research Reserve System (NERRS/NOAA) and the Alaska Department of Fish and Game. During my tenure at KBRR, I provided vision and direction for the development of the following biological programs for the Reserve, 1) long-term monitoring of abiotic trends (water quality, weather, vertical land-level change) and biotic trends (emergent salt marsh vegetation and associated biota, plankton and harmful algal blooms, and marine invasive species), and 2) directed/short-term research on juvenile salmon rearing and smolting habitat, hard-shell clam life history studies, sea otter survival and movement patterns, sea bird diet studies, and impacts on ocean acidification to larval Tanner crabs. I oversee the research program at the Reserve and supervise a team of four researchers and two graduate students, attend annual NERRS meetings to set standardized monitoring programs and funding for research, I served on the Coastal Training Program oversight committee, and on the NERRS Climate Change Adaptation Panel. I am the principal investigator on a grant to work with Homer and Kenai Peninsula Borough coastal zone managers to assess regional land and sea-level changes through intensive monitoring and modeling. I have been actively involved in research program development (written a 5-yr research plan), grant writing, communication of research results, and building upon and forming new partnerships with communities, Universities, State, and Federal agencies.

Recent Employment:
Wildlife Biologist (1992-2008), U.S. Fish and Wildlife Service, Marine Mammals Management 1011 E Tudor Road, Anchorage AK 99503

During my 16-yr tenure, I worked on directing and development of the following biological programs for sea otters 1) bio-monitoring program, 2) population abundance and distribution surveys, and 3) studies of individual health by monitoring, contaminate exposure, disease agents, and body condition. For all programs, I was responsible for planning, budget management, study design, implementation, analysis, and report writing. Data from these studies have been used in population stock assessment reports and in publications. I have conducted extensive sea otter/marine bird surveys in the near-shore coastal habitat in Alaska including Aleutian and Kodiak archipelagos, Alaska Peninsula, and the Gulf of Alaska and Yakutat Bay. I worked to standardize sampling methods (tissue collection techniques) and survey methods which were applied to Native co-management projects, international collaborations, and cooperative work within our National Wildlife Refuges. I am the International Union for Conservation of Nature and Natural Resources (IUCN) species representative for sea otters to the International Otter Specialist Group. In this role, I directed and facilitated the development of formal goals for the management and conservation throughout the species' range and organized the Area V, U.S./Russia Sea Otter Working Group meetings in Alaska and in California. I have authored or co-authored 11 scientific papers in peer reviewed journals and since 1992, authored 11 peer reviewed reports.

I coordinated the public outreach for the Sea Otter Conservation Plan with the State of Alaska, Marine Mammal Commission, scientists, Alaska Native people, conservation groups, and the general public. I prepared a three-year planning document, "A Co-management Vision for the Sustainable Use of Sea Otter, Polar Bear, and Walrus", to guide marine mammal co-management work with Fish and Wildlife Service and coastal Alaska Native groups. I participated in a one-year lateral assignment (Special Assistant to the Marine Mammals Management Supervisor) and two rotational assignments (Refuges Planning Department and Migratory Bird Management) during my tenure.

Select Publications:

Doroff, A.M. and J. L. Bodkin. 1994. Sea Otter Foraging Behavior and Hydrocarbon Levels in Prey Following in the *Exxon Valdez* Oil Spill in Prince William Sound, Alaska. *In*: Marine Mammals and Oiling. ed. T. R. Loughlin. Academic Press.

Doroff, A. M., J. A. Estes, M. T. Tinker, D. M. Burn, and J. A. Evans. 2003. Sea Otter Population Declines in the Aleutian Archipelago. Journal of Mammalogy 84:55-64.

Ballachey B. E., J. L. Bodkin, S. Howlin, A. M. Doroff, and A. H. Rebar. 2003. Correlates to Survival of Juvenile Sea Otters in Prince William Sound, Alaska. Canadian Journal of Zoology 1494-1510.

Burn, D. M., A. M. Doroff, M. T. Tinker. 2003. Carrying Capacity and Pre-decline Abundance of Sea Otters (*Enhydra lutris kenyoni*) in the Aleutian Islands. Northwest Naturalist 84:145-148

Burn, D.M. and A.M. Doroff. 2005. Decline in sea otter (Enhydra lutris) populations along the Alaska Peninsula, 1986-2001. Fishery Bulletin 103:270-279.

Estes, J.A., M.T. Tinker, A.M. Doroff, and D.M. Burn. 2005. Continuing sea otter population declines in the Aleutian archipelago. Marine Mammal Science. 21:169-172.

Goldstein T, J.A.K. Mazet, V.A. Gill, A. M. Doroff, K. A. Burek, and J.A. Hammond. 2009. Phocine distemper virus in northern sea otters in the Pacific Ocean, Alaska, USA. Emerging infectious diseases. 15:925-927.

Recent Grants:

U.S Army Corp of Engineers 2007-2008: Principal Investigator (85K)
U.S Fish and Wildlife Service 2007-2010: Principal Investigator (655.7K)
State Wildlife Grants 2008-2009: Project Manager (145K)
University of New Hampshire, Science Collaborative 2010-2013: Principal Investigator (915K)

Kristine (Kris) Holderied

National Oceanic and Atmospheric Administration (NOAA) Kasitsna Bay Laboratory
2181 Kachemak Drive, Homer, Alaska 99603
907-235-4004 kris.holderied@noaa.gov

WORK EXPERIENCE

NOAA, National Ocean Service, National Centers for Coastal Ocean Science,
Kasitsna Bay Laboratory. Homer, AK **09/2005- present**
Director/Supervisory Physical Oceanographer: NOAA Director for the Kasitsna Bay Laboratory, a subarctic coastal marine ecosystem laboratory run in partnership with the University of Alaska Fairbanks (UAF). Develop and implement science and operations plans for the lab. Provide on-site coordination for facility construction activities. Coordinate research and education activities with regional partners, including local, state, and federal agencies, Alaska Native organizations, universities, public schools and non-profit education and conservation groups.

NOAA, National Ocean Service, National Centers for Coastal Ocean Science,
Center for Coastal Monitoring and Assessment. Silver Spring, MD **06/2000-09/2005**
Physical Scientist: Developed innovative technical solutions to address internal NOAA and external customer needs for remote sensing products and services in U.S. coastal regions. Used satellite data to map benthic habitats in support of NOAA's Coral Reef Program and developed applications of satellite-derived information to address issues with harmful algal blooms, estuarine and coastal eutrophication and climate change. Served as technical representative on remote sensing, habitat mapping and water quality sensor development contracts.

Old Dominion University, Center for Coastal Physical Oceanography. Norfolk, VA **11/1996-06/2000**
Graduate Research Assistant: Planned and conducted observational studies of density and circulation in the Chesapeake Bay, Inland Sea of southern Chile, and Gulf of California, Mexico.

U.S. Army Corps of Engineers, Norfolk District. Norfolk, VA **01/1992-11/1996**
Oceanographer: Project manager for environmental compliance projects, a navigation study, and a three-year water quality sampling program. Led development and technical management of multi-year, multi-million dollar delivery order contracts for Army training area management and general environmental compliance support for Federal facilities across the U.S.

GE Government Services. Norfolk, VA **11/1991-01/1992**
Systems Engineer (acoustics): Developed a training course in ocean acoustics.

U.S. Navy active duty - Rota, Spain; Cambridge, MA; Norfolk, VA; Bay St Louis, MS **05/1984-09/1991**
Naval Officer (Oceanographer): Provided meteorological, acoustic and tactical environmental forecasts to naval and merchant marine ships and aircraft in the North Atlantic Ocean and Mediterranean, Red and Black Seas. Provided local meteorological forecasts for Rota, Spain and Norfolk, VA. Managed divisions of up to 12 people, with responsibility for personnel supervision, training and administration.

EDUCATION

MIT-WHOI, M.S. 1988, Physical Oceanography, Cambridge MA. (Satellite scatterometer wind study)
U.S. Naval Academy, B.S. 1984, Oceanography, Annapolis MD. Valedictorian.

RECENT PUBLICATIONS

- Valle-Levinson, A., K. Holderied, C. Li, and R. J. Chant. 2007. Subtidal flow structure at the turning region of a wide outflow plume., J. Geophys. Res. 112. C04004, doi:10.1029/2006JC003746.
- Stumpf, R., S. Dunham, L. Ojanen, A. Richardson, T. Wynne, K. Holderied. 2005. Characterization and Monitoring of Temperature, Chlorophyll, and Light Availability Patterns in National Marine Sanctuary Waters: Final Report. NOAA NCCOS Technical Memorandum 13. Silver Spring, MD. 56 pp.
- National Oceanic and Atmospheric Administration. 2003. Atlas of the Shallow-Water Benthic Habitats of the Northwestern Hawaiian Islands (Draft). 160 pp.
- Stumpf, R.P., K. Holderied, and M. Sinclair. 2003. Determination of water depth with

high-resolution satellite imagery over variable bottom types. *Limnology and Oceanography*, v. 48(1, part 2), pp. 547-556.

- Caceres, M., A. Valle-Levinson, H.H. Sepulveda, and K. Holderied. 2002. Transverse variability of flow and density in a Chilean fjord. Continental Shelf Research, v. 22(11-13), pp. 1683-1698.

Abbreviated Curriculum Vitae

Tuula Hollmén, D.V.M., Ph.D.
Research Associate Professor of Marine Science (University of Alaska Fairbanks)
Science Director (Alaska SeaLife Center)
Alaska SeaLife Center and University of Alaska Fairbanks
P.O. Box 1329, Seward, AK 99664
Phone: 907-224-6323; Fax: 907-224-6320; E-mail:
tuula_hollmen@alaskasealife.org

EDUCATION

Ph.D. University of Helsinki, Helsinki, Finland (2002)
D.V.M. University of Helsinki, Helsinki, Finland (1992)

PROFESSIONAL INTERESTS

Physiological ecology, marine ornithology, conservation biology, decision support for conservation/resource management planning

PROFESSIONAL EXPERIENCE

Administrative

Science Director, Alaska SeaLife Center (2010-)
Eider Program Manager, Alaska SeaLife Center (2002-)

Research

Research Associate Professor of Marine Science (University of Alaska Fairbanks) (2005-)
Research Assistant Professor of Marine Science (University of Alaska Fairbanks) (2002-2005)
Visiting Scientist, U.S. Geological Survey, National Wildlife Health Center,WI (1997-2002)
Assistant Professor, University of Helsinki, Department of Basic Veterinary Sciences, Finland (1992-1996)
Visiting Scientist, National Biological Survey, Pacific Islands Science Center, HI (1994)

Current Professional Committee Service

Spectacled and Steller's eider recovery team, member
Steller's eider reintroduction committee, chair
North Pacific Research Board Science Panel, member

SELECTED RECENT PUBLICATIONS *(*Graduate student)*

Hollmén, T.E., DebRoy, C., Flint, P.L., Safine, D.E., Schamber, J., Riddle, A., Trust, K. 2010. Molecular typing of Escherichia coli strains associated with threatened sea ducks and near-shore marine habitats of southwest Alaska. Environmental Microbiology Reports, in press.

Federer, R.N.*, Hollmén, T.E., Esler, D., Wooller, M.J., Wang, S.W. 2010. Stable carbon and nitrogen isotope discrimination factors from diet to blood plasma, cellular blood, feathers, and adipose tissue fatty acids in spectacled eiders (*Somateria fischeri*). Canadian Journal of Zoology 88:866-874.

Latty, C.J.*, Hollmén, T.E., Petersen, M.R., Powell, A.N., Andrews, R.A. 2010. Abdominally implanted transmitters with percutaneous antennas affect the dive performance of common eiders. Condor 112:314-322.

Oppel S., Federer R.*, Powell A., and T. Hollmén. Effects of lipid extraction on stable isotope ratios in avian egg yolk – is arithmetic correction an alternative? Auk 127:72-78.

Wang, S.W., Hollmén, T.E., and S.J. Iverson. 2009, Validating quantitative fatty acid signature analysis to estimate diets of spectacled and Steller's eiders (Somateria fischeri and Polysticta stelleri). Journal of Comparative Physiology B 180:125-139.

Nilsson, P.*, Hollmén, T., Atkinson, S., Mashburn, K., Tuomi, P., Esler, D., Mulcahy, D,. and D. Rizzolo. 2008. Effects of ACTH, capture, and short term confinement on glucocorticoid concentrations in harlequin ducks (*Histrionicus histrionicus*). Comparative Biochemistry and Physiology 149:275-283.

Lehikoinen, A., Ost, M., Hollmén, T., and M. Kilpi. 2008. Does sex-specific duckling mortality contribute to male bias in adult common eiders? Condor 110:574-578.

Miles, K., Flint, P., Trust, K., Ricca, M., Spring, S., Arrieta, D., Hollmén, T., and B. Wilson. 2007. Polycyclic aromatic hydrocarbon exposure in Steller's eiders and harlequin ducks in the eastern Aleutian Islands, Alaska. Environmental Toxicology and Chemistry 26:2694-2703.

Hollmén, T., and D.E. Docherty. 2007. Orthoreovirus. In: Infectious and Parasitic Diseases of Wild Birds, 2nd ed. (N.J. Thomas, D.J. Forrester, and D.B. Hunter, eds). Iowa State University Press, Ames, Iowa.

Franson, J.C., Hoffman, D.J., Wells-Berlin, A.M., Perry, M.C., Shearn Bochsler, V., Finley, D.L., Flint, P.L., and T. Hollmén. 2007. Effects of dietary Selenium on tissue concentrations, pathology, oxidative stress, and immune function in common eiders (*Somateria mollissima*). Journal of Toxicology and Environmental Health 70:861-874.

Őst, M., E. Vitikainen, P. Waldeck, L. Sundstrőm, K. Lindstrőm, T. Hollmén, J.C. Franson, and M. Kilpi. 2005. Eider females form non-kin brood-rearing coalitions. Molecular Ecology 14:3903-3908.

Skerratt, L.F., J.C. Franson, C.U. Meteyer, and T.E. Hollmén. 2005. Causes of mortality in sea ducks (Mergini) necropsied at the USGS-National Wildlife Health Center. Waterbirds 28(2): 193-207.

Hario, M., and T. Hollmén. 2004. The role of male mate-guarding in pre-laying Common Eiders *Somateria m. mollissima* in the northern Baltic Sea. Ornis Fennica 81:119-127.

Matson, C.W., J.C. Franson, T. Hollmén, M. Kilpi, M. Hario, P.L. Flint, and J.W. Bickham. 2004. Evidence of chromosomal damage in Common Eiders (*Somateria mollissima*) from the Baltic Sea. Marine Pollution Bulletin 49:1066-1071.

Franson, J.C., T. Hollmén, P.L. Flint, J.B. Grand, and R.B. Lanctot. 2004. Contaminants in molting long-tailed ducks and nesting common eiders in the Beaufort Sea. Marine Pollution Bulletin 48:504-513.

Hollmén, T., J.C. Franson, P.L. Flint, J.B. Grand, R.B. Lanctot, D.E. Docherty, and H.M. Wilson. 2003. An adenovirus linked to mortality and disease in long-tailed ducks in Alaska. Avian Diseases 47:173-179.

Hollmén, T., J.C. Franson, M. Kilpi, D.E. Docherty, and V. Myllys. 2003. An adenovirus associated with intestinal impaction and mortality of male common eiders (*Somateria mollissima*) in the Baltic Sea. Journal of Wildlife Diseases 39:114-120.

Hollmén, T., J.C. Franson, M. Kilpi, D.E. Docherty, W.R. Hansen, and M. Hario. 2002. Isolation and characterization of a reovirus from common eiders (*Somateria mollissima*) from Finland. Avian Diseases 46:478-484.

Franson, J.C., T. Hollmén, R.H. Poppenga, M. Hario, M. Kilpi, and D. Finley. 2002. Lead and delta-aminolevulinic acid dehydratase in blood of common eiders (*Somateria mollissima*) from the Finnish archipelago. Ornis Fennica 79:87-91.

Hario, M., T. Hollmén, K.T. Scribner, and T.L. Morelli. 2002. Effects of mate removal on the fecundity of common eider *Somateria mollissima* females. Wildlife Biology 8:161-168.

Hollmén, T., J.C. Franson, M. Hario, S. Sankari, M. Kilpi, and K. Lindström. 2001. Use of serum biochemistry to evaluate nutritional status and health of incubating common eiders (*Somateria mollissima*) in Finland. Physiological and Biochemical Zoology 74:333-342.

Hollmén, T., J.C. Franson, D.E. Docherty, M. Kilpi, M. Hario, L.H. Creekmore, and M. Petersen. 2000. Infectious bursal disease virus antibodies in eider ducks and herring gulls. Condor 102:688-691.

Franson, J.C., T. Hollmén, R.H. Poppenga, M. Hario, M. Kilpi, and M.R. Smith. 2000. Selected trace elements and organochlorines: some findings in blood and eggs of nesting common eiders (*Somateria mollissima*) from Finland. Environmental Toxicology and Chemistry 19:1340-1347.

Franson, J.C., T. Hollmén, R.H. Poppenga, M. Hario, and M. Kilpi. 2000. Metals and trace elements in tissues of common eiders (*Somateria mollissima*) from the Finnish archipelago. Ornis Fennica 77:57-63.

Hollmén, T., J.T. Lehtonen, S. Sankari, T. Soveri, and M. Hario. 1999. An experimental study on the effects of polymorphiasis on common eider ducklings. Journal of Wildlife Diseases 35:466-473.

Hollmén, T., J.C. Franson, L.H. Creekmore, J.A. Schmutz, and A.C. Fowler. 1998. *Leucocytozoon simondi* in emperor geese from the Yukon-Kuskokwim Delta in Alaska. Condor 100:402-404.

Russell Ross Hopcroft

Institute of Marine Science, University of Alaska Fairbanks
O'Neill Building
Fairbanks, AK 99775-7220
(907) 474-7842 Fax (907) 474-7204

PROFESSIONAL PREPARATION:

University of Guelph, Ontario, Canada	Marine Biology	B.Sc.	1983
University of Guelph	Marine Ecology	M.Sc.	1988
University of Guelph	Marine Biology	Ph.D.	1997
Monterey Bay Aquarium Research Institute (MBARI)	Zooplankton Ecology	1997-1999	
University of Massachusetts Dartmouth	Zooplankton Ecology	1999-2000	

APPOINTMENTS:

Professor, Institute of Marine Science, University of Alaska Fairbanks, 2010-present
Associate Professor, Institute of Marine Science, University of Alaska Fairbanks, 2005-2010
Assistant Professor, Institute of Marine Science, University of Alaska Fairbanks, 2000-2005

MOST RELEVANT PUBLICATIONS: (out of 67)

Mundy, P., D. Allen, J.L. Boldt, N.A. Bond, S. Dressel, E. Farley Jr., D. Hanselman, J. Heifetz, **R.R. Hopcroft**, M.A. Janout, C. Ladd, R. Lam, P. Livingston, C. Lunsford, J.T. Mathis, F. Mueter, C. Rooper, N. Sarkar, K. Shotwell, M. Sturdevant, A.C. Thomas, T.J. Weingartner & D. Woodby. 2010. Status and trends of the Gulf of Alaska Coastal region, 2003-2008. pp. 142-195. *In:* S.M. McKinnell & M. Dagg (ed.) Marine Ecosystems of the North Pacific Ocean; 2003-2008. *PICES Spec. Pub. 4. 393p.*

Pinchuk, A.I., K.O. Coyle & **R.R. Hopcroft**. 2008. Climate-related variability in abundance and reproduction of euphausiids in the northern Gulf of Alaska in 1998-2003. *Prog. Oceanogr.* **77**: 203-216.

Liu, H. & **R.R. Hopcroft**. 2007. A comparison of seasonal growth and development of the copepods *Calanus marshallae* and *C. pacificus* in the northern Gulf of Alaska. *J. Plankton Res.* **29**: 569-581.

Pinchuk, A.I. & **R.R. Hopcroft**. 2007. Seasonal variations in the growth rate of euphausiids (*Thysanoessa inermis*, *T. spinifera*, and *Euphausia pacifica*) from the northern Gulf of Alaska. *Mar. Biol.* **151**: 257-269

Hopcroft, R.R., C. Clarke, A.G. Byrd & A.I. Pinchuk. 2005. The paradox of *Metridia* spp. egg production rates: A new technique and measurements from the coastal Gulf of Alaska. *Mar. Ecol. Prog. Ser.* **286**: 193-201.

OTHER SIGNIFICANT PUBLICATIONS:

Hopcroft, R.R., B.A. Bluhm, & R.R. Gradinger. 2008. Arctic Ocean Synthesis: Analysis of Climate Change Impacts in the Chukchi and Beaufort Seas with Strategies for Future Research (2nd edition). *North Pacific Research Board, Anchorage, Alaska. 153 p*

Liu, H. & **R.R. Hopcroft**. 2008. Growth and development of *Pseudocalanus* spp. in the northern Gulf of Alaska. *J. Plankton Res.* **30**: 923-935.

Pinchuk, A.I. & **R.R. Hopcroft**. 2006. Reproduction and early development of *Thysanoessa inermis* and *Euphausia pacifica* (Crustacea: Euphausiacea) in the northern Gulf of Alaska. *J. Exp. Mar Biol. Ecol.* **332**:206-215.

Liu, H. & **R.R. Hopcroft**. 2006. Growth and development of *Neocalanus flemingeri/plumchrus* in the northern Gulf of Alaska: validation of the artificial cohort method in cold waters. *J. Plankton Res.* **28**: 87-101.

Napp, J.M., **R.R. Hopcroft**, C.T. Baier & C. Clarke 2005. Distribution and species-specific egg production of *Pseudocalanus* in the Gulf of Alaska. *J. Plankton Res.* **27**: 415-426.

SYNERGISTIC ACTIVITIES:

Public outreach through contributions to magazines (National Geographic, Current: the Journal of Marine Education), radio, newspaper, and television on Arctic ecosystems

Educational web-pages:
http://www.arcodiv.org/index.html
http://www.sfos.uaf.edu/sewardline/
http://www.oceanexplorer.noaa.gov/explorations/05arctic/welcome.html,
http://www.oceanexplorer.noaa.gov/explorations/02arctic/welcome.html,
http://oceanexplorer.noaa.gov/explorations/09arctic/welcome.html

Steering Group – Census of Marine Life's (CoML) Arctic Ocean Biodiversity (ArcOD) & Census of Marine Zooplankton (CMarZ), Circumpolar Biodiversity Monitoring Program (CBMP) Marine Experts Group, Executive Committee member - Northeast Pacific GLOBEC

Editorial Board – Marine Biodiversity (Springer)

Reviewer: manuscripts reviewed for 15 primary journals, proposals for 8 funding agencies, NSF OPP panel (2004), NSF BO panel (2008).

RESEARCH CRUISE EXPERIENCE:

~600 days at sea on cruises of 4-35 days duration aboard vessels ranging in size from 15-120 m.

COLLABORATORS & OTHER AFFILIATIONS

Collaborators: Ann Bucklin (UConn), Ken Coyle (UAF), Mike Dagg (LUMCON), Evelyn Lessard (UW), Ksenia Kosobokova (RAS), Jeff Napp (PMEL-NOAA), John Nelson (UVic), Torkel Nielsen (DMU), Jenny Purcell (WWU), Kevin Raskoff (CSUMB), Suzanne Strom (WWU), Mike Vecchione (SI-NMNH), Marsh Youngbluth (HBOI)

Graduate advisor: John C. Roff (Acadia U)

Postdoctoral advisors: Bruce H. Robison (MBARI), Francisco Chavez (MBARI), Brian Rothchild (UMass)

Graduate Students: Laura Slater (M.Sc. 2004), Jenefer Bell (M.Sc. 2009), Amanda Byrd (M.Sc. *in progress*), Hui Liu (Ph.D. 2006), Alexei Pinchuk (Ph.D. 2006), Imme Rutzen (Ph.D. *in progress*), Jennifer Questel (Ph.D., *in progress*), Elizaveta Ershova (Ph.D., *in progress*), Heather Oleson (Ph.D., *in progress*), Ayla Doubleday (M.Sc., *in progress*)

Biographical Sketch

KATRIN IKEN

ADDRESS: School of Fisheries and Ocean Sciences
University of Alaska Fairbanks
Fairbanks, AK 99775
Phone: (907) 474–5192 E-mail: iken@ims.uaf.edu

PROFESSIONAL PREPARATION:

B.A.	University of Düsseldorf, Germany (1987)
M.S.	University of Bayreuth, Germany (1991)
Ph.D.	Alfred Wegener Institute for Polar and Marine Research, Germany (1995)

APPOINTMENTS:

2007-present	Associate Professor School of Fisheries and Ocean Sciences, University of Alaska Fairbanks
2002 – 2007	Assistant Professor, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks
1999 – 2001	Postdoctoral Research Fellow, University of Alabama at Birmingham
1996 – 1999	Postdoctoral Research Fellow, Alfred Wegener Institute of Polar and Marine Research
1992 – 1995	Research Assistant (Graduate Student), Alfred Wegener Institute
1987 – 1991	Teaching Assistant, University of Bayreuth

SYNERGISTIC ACTIVITIES:

Development of Curricular Materials (classes not previously offered at UAF)
Antarctic Marine Biology, Marine Chemical Ecology, Macroalgae, Marine Biology & Ecology Field Class, Proposal Writing, Marine Invertebrates Summer Class
Workshop Organizer
Arctic Ocean Diversity Workshop (new Census of Marine Life initiative 2003); Editor for Proceedings Volume from this workshop; PRIMER-e workshop
Web Site Contributions
Contributions to Census of Marine Life NaGISA (Natural Geography In Shore Areas) Program; OBIS (Ocean Biogeographic Database) website on marine biodiversity
Community Outreach
Development of extra-curricular activities for K-12 and community groups, including Alaska Native communities, on marine biology and ecology, including field research
Service to scientific community
Reviewer for peer-reviewed journals (e.g., Polar Biology, Limnology & Oceanography, Progress in Oceanography, Marine Biology, Journal of Experimental Marine Biology and Ecology, etc)
Reviewer for funding agencies (e.g., NSF, NOAA, Sea Grant, NPRB, EVOS, NERC, AAD)
Guest editor Special Issue in Deep-Sea Research II – in press

10 SELECTED PUBLICATIONS (of 55 total):

Iken K, Konar B, Benedetti-Cecchi L, Cruz Motta JJ, Knowlton A, Pohle G, Mead A, Miloslavich P, Wong M, Trott T, Mieszkowska N, Riosmena-Rodriguez R, Airoldi L, Kimani E, Shirayama Y, Fraschetti S, Ortiz-Touzet M, Silva A. 2010. Large-scale spatial distribution patterns of echinoderms in nearshore rocky habitats. *PLoS ONE* 5:e13845.Bluhm, B.A., Iken, K., Mincks, S., Sirenko, B., Holladay, B. (*In press*). Epibenthic community structure in the Chukchi Sea. *Aquatic Research*

Konar B, Iken K, Cruz-Motta JJ, Benedetti-Cecchi L, Knowlton A, Pohle G, Miloslavich P, Edwards M, Trott T, Kimani E, Riosmena-Rodriguez R, Wong M, Jenkins S, Mead A, Silva A, Sousa Pinto I, Shirayama Y. (2010) Global Patterns of Macroalgal Diversity and Biomass in Rocky Nearshore Environments. *PLoS One* 5(10): e13195

Iken K, Bluhm BA, Dunton KH (2009) Benthic food web structure under differing water mass properties in the southern Chukchi Sea. *Deep-Sea Research II* doi:10.1016/j.dsr2.2009.08.007

Iken K, Amsler CD, Amsler MO, McClintock JB, Baker BJ (2009) Field studies on deterrent roles of phlorotannins in Antarctic brown algae. *Botanica Marina* 52: 547-557

Wulff A, Iken K, Quartino ML, Al-Handal A, Wiencke C, Clayton MN (2009) Biodiversity, Biogeography and Zonation of benthic micro- and macroalgae in the Arctic and Antarctic. *Botanica Marina* 52: 491-507

Konar B, Iken K, Edwards M (2009) Depth-stratified community zonation patterns on Gulf of Alaska rocky shores. *Marine Ecology* 30: 63-73

Konar B, Iken K (2009) Influence of taxonomic resolution and morphological functional groups in multivariate analyses of macroalgal assemblages. *Phycologia* 48: 24-31.

Chenelot HA, Iken K, Konar B, Edwards M (2007) Spatial and Temporal Distribution of Echinoderms in Rocky Nearshore Areas of Alaska. In: Rigby P.R. and Shirayama Y. (eds) Selected Papers of the NaGISA World Congress 2006, Publications of the Seto Marine Biological Laboratory, Special Publication Series Vol. VIII. pp 11-28

Iken K (1999). Feeding ecology of the Antarctic herbivorous gastropod *Laevilacunaria antarctica* Martens. *Journal of Experimental Marine Biology and Ecology, 236 (1)*, 133-148.

Iken K, Barrera-Oro ER, Quartino ML, Casaux RJ, Brey T (1997). Grazing in the Antarctic fish *Notothenia coriiceps*: Evidence for selective feeding on macroalgae. *Antarctic Science, 9 (4),* 386-391.

COLLABORATORS OVER PAST 48 MONTHS

Dr. Charles Amsler (UAB), Dr. Bill Baker (USF), Dr. Bodil Bluhm (UAF), Dr. JJ Cruz-Motta (USB, Venezuela), Dr. Ken Dunton (U Texas), Dr. Matthew Edwards (UCSD), Dr. Nora Foster (UAF), Dr. Rolf Gradinger (UAF), Dr. Russ Hopcroft (UAF), Dr. Max Hoberg (UAF), Dr. Brenda Konar (UAF), Dr. Jim McClintock (UAB), Dr. Patricia Miloslavic (USB, Venezuela), Dr. Gerhard Pohle (HMSC, Canada), Dr. Rafael Riosmena-Rodriguez (UABCS, Mexico), Dr. Yoshihisa Shirayama (Kyoto University, Japan), Dr. Boris Sirenko (ZIN, Russia), Dr. Jonny Stark (AAD, Australia), Dr. Terry Whitledge (UAF), Dr. Christian Wiencke (AWI, Germany)

GRADUATE ADVISORS

MS degree: Dr. Konrad Dettner

PhD degree: Dr. Wolf Arntz (co-advisor), Dr. Tom Brey (co-advisor), Dr. Gunter Kirst (member)

THESIS SPONSOR

Present chair: Tania Spurkland (PhD), Jared Weems (MS), Jamie McKellar (MS), Raphaelle Descoteaux (MS, co-chair), Amy Rath (MS)
Past chair: Heike Lippert (PhD, co-chair), Angela Dubois (MS), Carrie Parris (MS), Megan Murphy (MS), Melissa Deimann (co-chaired MS),
Present committee member: Katharine Miller (PhD), Brenna McConnell (MS), Martin

Schuster (MS), Matt Sexson (PhD), Shiway Wang (PhD), Laura Oxtoby (PhD)
Past committee member: Casey Debenham (MS), Reid Brewer (MS), Hector Douglas (PhD), Nick Harman (MS), Jennifer Bump (MS), Melanie Wenzel (MS), Renee Raudonis (MS)

Curriculum Vitae

David B. Irons
U.S. Fish and Wildlife Service
1011 East Tudor Road
Anchorage, Alaska 99503

Phone 907/786-3376
Email david_irons@fws.gov

Education

B. S. Environmental Resource Management 1976 Pennsylvania State University
M. S. Wildlife Ecology 1982 Oregon State University
Ph. D. Biology 1992 University of California, Irvine

Recent Professional Experience

1999-present	Alaska Seabird Coordinator, Migratory Bird Management, U.S. Fish and Wildlife Service
1993-1998	Marine Bird Monitoring Coordinator, Migratory Bird Management, U.S. Fish and Wildlife Service
1984-1992	Biologist, Migratory Bird Management, U.S. Fish and Wildlife Service

Committees

Alaska Region Representative, North American Colonial Waterbird Conservation Plan
Chair, Alaska Seabird Working Group
Chair, Circumpolar Seabird Group
Seabird Coordinator, Circumpolar Arctic Flora and Fauna (CAFF), Circumpolar Biodiversity Monitoring Network.
Chair, Pacific Seabird Group 2003
Chair, World Seabird Conference-International Steering Committee

Professional Societies

Ecological Society of America
The Wildlife Society
Pacific Seabird Group
Waterbird Society
Association of Field Ornithologists
American Ornithologists' Union
British Ornithologists' Union
Cooper Ornithological Society
Wilson Ornithological Society

Honors, Awards, and Fellowships

Special Achievement Award, U.S. Fish &Wildlife Service, 1983, 1990-1995, 1997, 1998, 2000, 2002
Exceptional Service Award, *Exxon Valdez* Oil Spill, U.S. Fish and Wildlife Service, 1989
Tuition Fellowship, University of California, Irvine, 1987,1988
Dean's List University of California, Irvine 1986, 1987
Oregon State University, 1978, 1979, 1980
Pennsylvania State University 1975
Senatorial Scholarship, U. S. Senate, 1971

Graduate Students Supervised

Golet, G. H. 1995. The cost of chick rearing in the Black-legged Kittiwake *Rissa tridactyla*. M.S. thesis. University of California Santa Cruz.

Golet, G. H. 1999. Variable costs of reproduction in a long-lived seabird, the Black-legged Kittiwake. Ph.D. dissertation. University of California Santa Cruz.
Sullivan, K. 2004. Effect of localized past breeding success on selection of recruitment areas by Black-legged Kittiwakes. Rutgers University.
Gall, A. 2004. The influence of breeding success on the number of Least Auklets occupying display areas. Oregon State University.
Sheffield, L. M. 2006. Nesting behavior of crested auklets and least auklets on St. Lawrence Island, Alaska: colony attendance and chick provisioning in relation to productivity. Oregon State University
Bixler, K. in progress. Restoration research of the pigeon guillemot following the Exxon Valdez Oil Spill.
Orben, R. in progress. Winter distributions of Black-legged Kittiwakes and Thick-billed Murres breeding from three colonies in the Bering Sea with differing population trends.

- Allyn, A. in progress. Distribution, diet, habitat use, and time/energy budgets of Kittlitz's *(Brachyramphus Brevirostris)* and Marbled Murrelets *(B. Marmoratus)* in Prince William Sound, Alaska

Literature Citations
Selected Publications

Agler, B.A., Kendall, S.J., Irons, D.B., and Klosiewski, S.P. 1999. Declines in Marine Bird Populations in Prince William Sound, Alaska Coincident with a Climatic regime Shift. Waterbirds 22:98-103.
Ainley, D.G., R. G. Ford, E. D. Brown, R. M. Suryan, and D. B. Irons. 2003. Prey availability, interference competition, and the geographic structure of seabird colonies: a study of black-legged kittiwakes and forage fish in Prince William Sound, Alaska. Ecology 84: 709-723.
Golet, G. H., K. J. Kuletz, D. D. Roby, D. B. Irons. 2000. Adult prey choice affects chick growth and reproductive success of Pigeon Guillemots. The Auk 117:82-91.
Golet, G. H., D. B. Irons, and J. A. Estes. 1998. Survival costs of chick rearing in Black-legged Kittiwakes. Journal of Animal Ecology 67:827-841.
Golet, G. H., D. B. Irons, and J. A. Estes. 2003. Mechanistic determinants of reproductive costs in a long-lived seabird: a multiyear experimental study of the black-legged kittiwake. Ecological Monographs, 74(2), 2004, pp 353-372.
Hunt, G.L., F. Mehlum, R.W. Russell, D.B. Irons, M.B. Decker, and P.H. Becker. 1999. Physical processes, prey abundance, and the foraging ecology of seabirds. *in*: Adams, N. and Slotow, R. (Eds.), Proc. 22 Int. Ornith. Congr., Durban, University of Natal.
Irons, D.B., T. Anker-Nilssen, A. J. Gaston, G. V. Byrd, K. Falk, G. Gilchrist, M. Hario, M. Hjernquist, Y. V. Krasnov, A. Mosbech, B. Olsen, A. Petersen, J. B. Reid, G. J. Robertson, H. Strøm, & K. D. Wohl. in press. Fluctuations in circumpolar seabird populations linked to climate oscillations. Global Change Biology.
Irons, D. B. 1998. Foraging area fidelity of individual seabirds in relation to tidal cycles and flock feeding. Ecology 79:647-655.
Irons, D. B., R. G. Anthony, and J. A. Estes. 1986. Foraging strategies of glaucous-winged gulls in a rocky intertidal community. Ecology 67(6):1460-1474.
Suryan, R.M., D.B. Irons, and J. Benson. 2000. Inter-annual variation in diet and foraging effort of kittiwakes in relation to prey abundance. Condor 102:374-384.
Peterson, C.H, S.D. Rice, J.W. Short, D. Esler, J. L. Bodkin, B.E. Ballachey, D.B. Irons. 2003. Long-term Ecosystem Response to the Exxon Valdez Oil Spill. Science 302:2082-2086. Ainley, David, H.T. Harvey and Associates

Collaborators: Anker-Nilssen, Tycho, NINA, Anthony, Jill, Johns Hopkins U., Norway, Benson, Benson, Jeb, UAF, Byrd, Vernon, USFWS, Gall, Adrian, ABR Consulting, Drew, Gary, USGS, Dragoo, Don, USFWS, Dugger, Katie, OSU, Erickson, Wally, West Inc., Estes , Jim, USGS, Ford, Glenn, R.G. Ford Consulting, Gaston, Tony, Canadian Wildlife Service, Golet, Greg, TNC, Hunt, George, UCI, Jodice, Pat, Clemson U., Kaufmann, Max UAF, Kendall, Steve, USFWS, Kettle, Arthur, USFWS, Kuletz, Kathy, USFWS, Lance, Brian, NMFS, McDonald, Lyman, West Inc., Ostrand, Bill, USFWS, Piatt, John, USGS, Roby, Dan, OSU, Roseneau, Dave, USFWS, Schmutz, Joel USGS, Sheffield, Lisa, OSU, Stephensen, Shawn, USFWS, Shultz, Michael, USGS, Suryan, Rob, OSU, Sydeman, Bill, Pt. Reyes Bird Obs., Turco, Kathy, self employed, Wohl, Kent, USFWS

Brenda Konar

Professor
School of Fisheries and Ocean Sciences, University of Alaska Fairbanks
P.O. Box 757220, Fairbanks, Alaska 99775
e-mail: bkonar@guru.uaf.edu, phone: 907-474-5028 / fax: 907-474-5804

Academic Preparation

San Jose State University, San Jose, CA	Zoology	B.A. 1986
Moss Landing Marine Laboratories, CA	Marine Sciences	M.S. 1991
University of California, Santa Cruz	Biology	Ph.D. 1998

Appointments

2009- PRESENT: Professor, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks (UAF).
2004-2009: Associate Professor, School of Fisheries and Ocean Sciences, UAF.
2006-PRESENT: Science Director, Kasitsna Bay Laboratory. UAF.
2004-2006: Interim Lab Director, Kasitsna Bay Laboratory. UAF.
2000 to 2004: Assistant Professor, School of Fisheries and Ocean Sciences, UAF.
1999 to 2000: Research Assistant Professor, School of Fisheries and Ocean Sciences, UAF.
1999 to PRESENT: Staff Scientist for the West Coast and Polar Regions National Undersea Research Center.

Current Activities

Education & Outreach:

Arctic: Biodiversity in the Arctic Workshop. 10-14 April 2003. Fairbanks Alaska. <u>Workshop Organizer</u>.
Proceedings: Iken K and B Konar (eds.) 2003. Proceedings of the Arctic Biodiversity Workshop: New Census of Marine Life Initiative. Alaska Sea Grant College Program, University of Alaska Fairbanks, M-26, Fairbanks. 162pp.
Cold Water Diving: Current chair of the University of Alaska's Diving Control Board and board member of the national American Academy of Underwater Sciences. Also instructor of Cold Water Diving and Scientific Diving at the University of Alaska Fairbanks
Field sampling: Invited speaker at the Through-ice Sampling Workshop. 7 November 2007. Fairbanks Alaska. Sponsored by the Minerals Management Service.
Statistical: Co-organizer for the Primer-e Statistical Package Workshop. 27 August-1 September 2007. Fairbanks Alaska.

Development of Curricular Materials:

Field Topics in Marine Biology, Kelp Forest Ecology, and several seminars including Macroalgae, Controversies in Science, and Professional Development

Committee examples:

International: Natural Geography Inshore Areas (NaGISA) Steering Committee (current co-PI)
National: National Research Council Study Committee for the North Pacific Research Board (past)
State: Kachemak Bay National Research Reserve Advisory Council (current)
University-wide: Faculty Senate (current)
Department-wide: Marine Biology Tenure & Promotion committee (past chair)

Examples of Outreach:

K-12 presentations at 15 different schools, Alaska native community presentations at 10 different communities in Alaska, multiple media interactions

Reviewer History:

Multiple papers and proposals for various peer-reviewed journals and funding agencies

Ten Relevant Publications

Daly B and B Konar. In Press. Temporal trends in nearshore juvenile and adult crab populations in different habitats. Crustaceana.

Konar, B, K Iken and M Edwards. 2009. Depth-stratified community zonation patterns on Gulf of Alaska rocky shores. Marine Ecology 30:63-73.

Konar B and K Iken. 2009. Influence of taxonomic resolution and morphological functional groups in multivariate analyses of macroalgal populations. Phycologia 48:24-31.

Daly B and B Konar. 2008. Effects of macroalgal structural complexity on nearshore larval and post-larval crab composition. Marine Biology 153:1055-1064.

Coyle K.O., B.A. Bluhm, B. Konar, A.L. Blanchard and R.C. Highsmith. 2007. Amphipod prey of gray whales in the northern Bering Sea: comparison of biomass and distribution between the 1980s and 2002 - 2003. Deep Sea Research II 54: 2906-2918.

Hamilton, J. and B. Konar. 2007. The influence of kelp variability and substrate complexity on northern nearshore fish abundance. Fishery Bulletin 105:189-196.

Konar, B. 2007. Recolonization of a high latitude hard-bottom nearshore community. Polar Biology 30:663-667.

Konar B and K Iken. 2005. Competitive dominance among sessile marine organisms in a high arctic boulder community. Polar Biology 29:61-64.

Konar B, R Riosmena-Rodriguez and K Iken. 2006. Rhodolith bed: a newly discovered habitat in the North Pacific. Botanica Marina 49:355-359.

Konar, B and Estes, JA. 2003. The stability of boundary regions between kelp beds and deforested areas. Ecology 84: 174-185.

Collaborators in the last 48 months

Dr. Lisandro Benedetti-Cecchi (University of Pisa, Italy)
Dr. Lee Cooper (University of Tennessee)
Dr. Juan J. Cruz (Simon Bolivar University, Venezuela)
Dr. Ken Dunton (University of Texas)
Dr. Matt Edwards (San Diego State University)
Dr. James Estes (University of California Santa Cruz)
Dr. Jackie Grebmeier (University of Tennessee)
Dr. Katrin Iken (University of Alaska Fairbanks)
Dr. Tohru Iseto (Seto Marine Biological Lab, Kyoto University, Japan)
Dr. Edward Kimani (Kenya Marine and Fisheries Research Institute, Mombassa)
Dr. Ann Knowlton (University of Alaska Fairbanks)
Dr. Patricia Miloslavich (Simon Bolivar University, Venezuela)
Dr. Gerhard Pohle (The Huntsman Marine Science Centre, Canada)
Dr. Yoshihisa Shirayama (Seto Marine Biological Lab, Kyoto University, Japan)
Dr. John Trefry (Florida Institute of Technology)

Thesis Sponsor

Present Chair: Martin Schulster (MS), Alexandra Ravelo (MS), Steven Savard (MS), Nathan Stewart (PhD), Terril Efird (MS), Amy Tippery (MS)

Past Chair: Melissa Deiman (MS), Brooke McFarland (MS), Tracie Merrill (MS), Joel Markis (MS), Benjamin Daly (MS), Casey Debenham (MS), Heather Patterson (MS), Judith Hamilton (MS), Heloise Chenelot (MS), Catherine Hegwer (MS), Reid Brewer (MS)

Present committee member: Tania Spurkland (PhD), Benjamin Daly (PhD)
Past committee member: Seanbob Kelly (MS), Arny L Blanchard (PhD), Angela Dubois (MS), Christine Frazier (MS). Eloise Brown (MS), Ann L Knowlton (PhD).

CRAIG O. MATKIN, B.A., M.S.

(907) 235-6295 (home) (907) 235-6590 (office)
3430 Main St. Suite B1Homer, Alaska 99603
cmatkin@acsalaska.net
www.whalesalaska.org

EDUCATION

B.A. in Biology, University of California, Santa Cruz (1974)
M.S. in Zoology, University of Alaska Fairbanks (1980)

PROFESSIONAL EXPERIENCE

Executive Director, North Gulf Oceanic Society, Homer, Alaska, (1982-present)

Supervise and conduct research on cetaceans, primarily killer whales and humpback whales, oversee stranding network and educational operations, operate and outfit research vessels. Maintain collaborations with numerous institutions and oversee fiscal operations of NGOS.

Adjunct faculty, University of Alaska, Kenai Peninsula College, Kachemak Bay Campus, Homer, Alaska (1999-present)

Teaching of marine mammal classes and guest lectures on marine topics. Participation in elder hostel program.

Commercial Fisherman, Gulf of Alaska, Alaska (1977-1997)

Outfitting and operation of commercial fishing vessels harvesting, salmon, herring and various species of crab. Participation on boards of various fishing organizations.

RELATED EXPERIENCE

Mr. Matkin has conducted research on marine mammals in southern Alaska since 1977. He completed work on harbor seals and Steller sea lions and their interactions with fisheries in 1977-79 leading to an M.S. degree. He initiated photo-identification work of killer whales and humpback whales in Prince William Sound in 1977. Since 1982 he has worked as executive director of the North Gulf Oceanic Society, acted as principal investigator on numerous contracts from the National Marine Mammal Laboratory, National Marine Fisheries Service; the U.S. Fish and Wildlife Service; Sea Grant Marine Advisory Program; Alaska Council on Science and Technology, U.S. Marine Mammal Commission; Hubbs Sea World Research Institute, the *Exxon Valdez* Trustee Council, the North Pacific Universities Marine Mammal Research Consortium and the Alaska Sea Life Center. He has directed the NGOS long-term photo-identification project examining killer whale population dynamics in Alaska since 1984. He has conducted population/distribution/genetics research on humpback whales from southeast Alaska to the Aleutian Islands and western Alaska, most recently as part of the SPLASH program. He has specialized in biopsy sampling of various cetaceans including killer whales, humpback whales, fin whales and sperm whales.   Using the biopsy sampling technique he has investigated population genetics and environmental contaminant levels in killer whales and humpback whales, and most recently, feeding habits using stable isotopes and lipid/fatty acids. With collaborators he has developed small telemetry packages for remote attachment to killer whales and other cetaceans and applied ARGOS satellite sytems to tracking killer whales. He directed work for the past 20 years (1989-present) contracted by the *Exxon Valdez* Oil Spill Trustee Council and National Marine Fisheries Service assessing the long-term impacts of the *Exxon Valdez* Oil Spill on killer whales. He currently supervises a killer whale research program that extends from southeastern Alaska to the Eastern Aleutians. He has participated in marine mammal stranding work since 1986 as a designated agent of the National Marine Fisheries Service, providing field response and reports.   Recently he has reviewed the status of the Cook Inlet beluga whale and provided recommendations to the National Marine Fisheries Service and he is the scientific reviewer for the Eagle River Flats beluga studies

MEMBERSHIPS

Alaska Scientific Review Group (Advising the National Marine Fisheries Service on marine mammal stock issues)
Society for Marine Mammalogy (Active group of Marine Mammal Scientists)

SELECTED RECENT PUBLICATIONS

Saulitis, E.L., **C.O. Matkin**, L. Barrett-Lennard, K. Heise and G. Ellis. 2000. Foraging strategies of sympatric killer whale (*Orcinus orca*) populations in Prince William Sound, Alaska Marine Mammal Science, 16(1)94-109.

Scheel, D. **C.O. Matkin**, E Saulitis. 2001. Distribution of killer whale pods in Prince William Sound, Alaska over a thirteen year period 1984-96. Marine Mammal Science.17(3)

Ylitalo, G.M., **C.O. Matkin**, J. Buzitis, M. M. Krahn, L. L. Jones, T. Rowles, and J. Stein. 2001. Influence of Life-History Parameters on Organochlorine Concentrations in Free-Ranging Killer Whales (*Orcinus orca*) from Prince William Sound, Alaska. The Science of the Total Environment 281:183-203.

Matkin, C O., L. Barrett-Lennard, G. Ellis. 2002. Killer Whales and Predation on Steller sea lions. In Demaster, D. and Atkinson. S. Steller Sea Lion Decline: Is it Food II. University of Alaska, Sea Grant College Program AK-SG-02-02

Heise, K., L. G. Barrett-Lennard, E. L. Saulitis, **C. O. Matkin** and D. Bain. 2003. Examining the evidence for killer whale predation on Steller sea lions in British Columbia and Alaska. Aquatic Mammals 29:325-334.

Matkin, C. O., G. M. Ellis, L. G. Barrett-Lennard, H. Yurk, E. L. Saulitis, D. Scheel, P. Olesiuk and G. Ylitalo. 2003. Photographic and acoustic monitoring of killer whales in Prince William Sound and Kenai Fjords, *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 03012 Final Report), North Gulf Oceanic Society, Homer, Alaska.

Saulitis, E., **C. O. Matkin** and F.H. Fay. 2005. Vocal repertoire and acoustic behavior of the isolated AT1 killer whale subpopulation in Southern Alaska. Canadian Journal of Zoology **83**: 1015-1029.

Matkin, C. O., E. Saulitis, D. Maldini, J. Maniscalco and L. Mazzuca. 2005. Steller sea lion predation by killer whales in Kenai Fjords/Prince William Sound, Alaska. Pages 212-226 *in* T. R. Loughlin, S. K. Atkinson and D. G. Calkins, eds. Synopsis of research on Steller sea lions: 2001-2005. Alaska SeaLife Center's Steller Sea Lion Research Program, Seward, Alaska. 344 pp.

Herman, D.P., D.G. Burrows, P.R. Wade, J.W. Durban, **C.O. Matkin**, R.G. LeDuc, L.G. Barrett-Lennard, and M.M. Krahn. 2005. Feeding ecology of eastern North Pacific killer whales Orcinus orca from fatty acid, stable isotope, and organochlorine analyses of blubber biopsies. Mar Ecol. Prog. Ser.302:275-291

Matkin, C. O., E. Saulitis, D. Maldini, J. Maniscalco and L. Mazzuca. 2005. Steller sea lion predation by killer whales in Kenai Fjords/Prince William Sound, Alaska. Pages 212-226 *in* T. R. Loughlin, S. K. Atkinson and D. G. Calkins, eds. Synopsis of research on Steller sea lions: 2001-2005. Alaska SeaLife Center's Steller Sea Lion Research Program, Seward, Alaska. 344 pp.

Matkin, C.O, L. Barrett-Lennard, H. Yurk, D. Ellifrit, and A. Trites. 2007. Ecotypic variation and predatory behavior of killer whales (*Orcinus orca*) in the Eastern Aleutian Islands, Alaska. Fishery Bulletin 105:74-87

Maniscalco, J.M., **C.O. Matkin,** D. Maldini, D.G. Calkins, S. Atkinson. 2007. Assessing Killer Whale predation on Steller sea lions from field observations in Kenai Fjords, Alaska. Marine Mammal Science 23(2): 306-321.

Krahn, M.M, DP Herman, **C.O. Matkin**, JW Durban, L. Barrett-Lennard, DG Burrows, MD Dahlheim, N. Black, RG Leduc, PR Wade 2007. Use of chemical tracers in assessing the diet and foraging regions of eastern North Pacific killer whales Mar Environ. Res 63:91-114

Wade, P. R., V. N. Burkanov, M. E. Dahlheim, N. A. Friday, L. W. Fritz, T. R. Loughlin, S. A. Mizroch, M. M. Muto, D. W. Rice, L. G. Barrett-Lennard, N. A. Black, A. M. Burdin, J. Calambokidis, S. Cerchio, J. K. B. Ford, J. K. Jacobsen, **C. O. Matkin**, D. R. Matkin, A. V. Mehta, R. J. Small, J. M. Straley, S. M. McCluskey, G. R. Van Blaricom, and P. J. Clapham.. 2007. Killer whales and marine mammal trends in the North Pacific – a re-examination of evidence for sequential megafauna collapse and the prey-switching hypothesis. Marine Mammal Science 23:766-802.

Matkin CO, Saulitis EL, Ellis GM, Olesiuk P, Rice SD 2008. Ongoing population level impacts on killer whales following the *Exxon Valdez* oil spill in Prince William Sound, Alaska. Marine Ecological Progress Series 356: 269-281

Herman, DP, **CO Matkin,** Gina Ylitalo, JW Durban, MB Hanson, ME Dahlheim, JM Straley, PLWade, KL Tilbury, RH Boyer, RW Pearce, MM Krahn. 2008. Assessing the age-distributions of killer whale (*Orcinus orca*) populations from the composition of endogenous fatty acids in their outer-blubber layers Marine Ecological Progress Series 372: 289-302

Yurk, H, O Filatova, **C.O. Matkin**, L.G. Barrett-Lennard, and M. Brittain. 2010. Sequential habitat use by two resident killer whale (*Orcinus orca*) clans in Resurrection Bay, Alaska as determined by remote acoustic monitoring. Aquatic Mammals 36(1), 67-78

Matkin, C.O., Graeme Ellis, David Herman, Eva Saulitis, Russel Andrews, Allison Gaylord, and Harald Yurk 2010. Monitoring, Tagging, Acoustics, Feeding Habits and Restoration of Killer Whales in Prince William Sound/Kenai Fjords 2003-2009. North Gulf Oceanic Society, Homer, Alaska

Durban, J., Ellifrit, D.Dahlheim M., Waite, J.. **Matkin, C**., Barrett-Lennard L, Ellis, G., Pitman, R., Leduc, R. and Wade, P. 2010. Photographic mark-recapture analysis of clustered mammal-eating killer whales around the Aleutian Islands and Gulf of Alaska. Marine Biol.

Barrett-Lennard L.G., **C. O. Matkin**, J. W. Durban , E L. Saulitis, D. Ellifrit. In press. Predation of gray whales and prolonged feeding on submerged carcasses by transient killer whales at Unimak Island, Alaska Marine Ecological Progress Series.

Molly (Mary Elizabeth) McCammon
mccammon@aoos.org
Work Telephone: (907) 644-6703 **or** Mobile Telephone: (907) 227-7634
1007 West Third Avenue, Suite 100, Anchorage, Alaska 99501

PROFESSIONAL EXPERIENCE

July 2003 – Present
Alaska Ocean Observing System (AOOS). Executive Director.

Responsibilities
- Develop the Alaska regional component of the national Integrated Ocean Observation System (IOOS).
- Represent Alaska interests in National Federation of Regional Associations (NFRA) and further development of national IOOS.
- Work with Alaska members to establish an integrated system of ocean observations for Alaska to meet the needs of a wide variety of users, including mariners and fishermen, scientists, resource managers, search and rescue and coastal security operations, and educators.

July 2009 – Present
Lead PI for COSEE Alaska, funded by NSF**.**

Responsibilities
- Oversee senior management team developing statewide program to increase broader impacts of ocean scientists in Alaska Arctic, with a focus on climate change.
- Increase interactions between ocean scientists and informal and formal education audiences and providers.

1993 - 2003
***Exxon Valdez* Oil Spill Trustee Council**. Executive Director.

Responsibilities
- Implement policies and direction of six-member, joint federal-state Trustee Council which is required to have unanimity for all decisions.
- Administer programs funded by $900 million trust fund established by settlement of government claims against Exxon Corporation following 1989 oil spill, including annual work plans ranging in size from $6 million - $25 million a year.

Major Accomplishments
- Developed oil spill restoration program that is now viewed as an international model.
- Guided planning and successful review by National Academy of Sciences of ground-breaking long-term environmental monitoring program (Gulf Ecosystem Monitoring – GEM).

- Negotiated and implemented one of largest habitat acquisition programs in the nation and sustained it over nearly a decade of scrutiny by public officials and others.

Recent Professional Activities

- 2005 – present, national chair, National Federation of Regional Associations (NFRA) of Coastal and Ocean Observing; 2003- present, Alaska representative to NFRA.
- 2006 – present, co-chair, ocean observing sub-panel of national Ocean Research and Resources Advisory Panel; past ORRAP member 2006-2009.
- 2008 – present, member, National Academy of Sciences Polar Research Board.
- 2004 - present, Board member representing city of Anchorage and past President, Cook Inlet Regional Citizens' Advisory Council.
- 2004 – present, Alaska Sea Grant Program, Advisory Group member.
- 2005 – present, Fellow, Cooperative Institute for Arctic Research, University of Alaska Fairbanks.
- 2004 – 2006, member, National Research Council Committee to Establish an Arctic Observing Network.
- 2003 - 2010, Board member, Prince William Sound Science Center.

Past Experience 1984 – 1993

Ten years experience in Alaska public policy, specializing in natural resources, fisheries, and Alaska Native issues, working for Alaska Governor Bill Sheffield, the Alaska Department of Fish and Game, Chief of Staff for Senate Finance Chairman John Binkley, and Senate Fisheries Committee aide.

Past Experience 1973 – 1984

Reporter/writer for various news media and organizations.

Other

- *1975 – 1984*. Homesteaded in the western Brooks Range. Co-owner and operator, recreational guiding service.

Education

B.A. in Journalism, University of California, Berkeley, 1973. Phi Beta Kappa.

John R. Moran

Tel: (907) 789-6014
Email: John.Moran@noaa.gov

EDUCATION
University of Alaska Fairbanks, M.S. in Fisheries, August 2003.
University of New Hampshire, B.A. in Zoology, minor in Marine Biology, May 1989.

PROFESSIONAL EXPERIENCE
Research Fisheries Biologist, *U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Auke Bay Laboratory, Juneau AK. August 2006- present*
Research Associate, *University of Alaska Southeast, Juneau, AK.* September 2003- August 2006
Research Assistant, *University of Alaska Fairbanks, Juneau, AK.* January 2002-May 2003
Weir Crew Leader, *SWCA, Salt Lake City, UT.* September 2001-November 2001
Graduate Intern, *Alaska Department of Fish and Game, Juneau, AK.* April 2000-April 2001
Teaching Assistant, *University of Alaska Fairbanks, Juneau, AK.* September 1999-December 2000
Biological Technician (Fisheries), *U.S. Fish and Wildlife Service, Togiak NWR, Dillingham, AK***.** April 1998-August 1999
Biological Science Technician (Wildlife), *U.S. Fish and Wildlife Service, Togiak NWR, Dillingham, AK*
Fisheries Technician/Tagger/Diver, *Prince William Sound Aquaculture, Cordova, AK.* February 1992-April 1993

PUBLICATIONS (primary author):

John R. Moran and Rowena D. Flinn. Opportunistic Foraging on Seal Blood by Snow Buntings. (submitted to Canadian Field-Naturalist).

John R. Moran, Janice M. Straley, Terrence J. Quinn II, Stanley D. Rice, and Suzanne F. Teerlink. Late-season abundance and seasonal trends of humpback whales in Prince William Sound, Lynn Canal and Sitka Sound, Alaska. (In prep. for Marine Ecology Progress Series).

John R. Moran, Kevin Boswell, and Janice M. Straley. Opportunistic in situ length measurements of humpback whales (Megaptera novaeaglia) and Steller sea lions (Eumetopais jubatus) using dual frequency identifying sonar (DIDSON). (In prep. for Marine Mammal Science).

Moran, J.R., M. Adkison, and B. Kelly. Counting seals: Estimating the unseen fraction using a photographic capture-recapture and covariate model. (In prep. for Canadian Journal of Zoology).

Moran, J.R. 2003. Counting seals: Estimating the unseen fraction using a covariate and capture-recapture model. M.S. Thesis, University of Alaska Fairbanks.

Moran, J.R., and C. Wilson. 1996. Abundance and distribution of marine mammals in northern Bristol Bay and southern Kuskokwim Bay - a status report of the marine mammal monitoring effort at Togiak NWR. Annual report 1995. USFWS report, 19 pp. Dillingham, AK.

Moran, J.R. 1994. Landbird monitoring at Cape Peirce, Alaska, 1994. USFWS report, 4 pp. Dillingham, AK.

Moran, J.R.1994. Waterfowl and shorebird observations at Chagvan Bay and Cape Peirce, Alaska, 1994. USFWS report, 8 pp. Dillingham, AK

Moran, J.R. 1994. Small mammal studies and observations at Cape Peirce, Alaska, 1993. USFWS report, 5 pp. Dillingham, AK.

PUBLICATIONS (co-author):

Shawna Karpovich and John R. Moran Identifying Regional Variation in Harbor Seal Fatty Acid Signatures Using Analysis of Similarity (ANOSIM). (In prep. for Marine Ecology Progress Series).

Brendan P. Kelly, Oriana H. Badajos, Mervi Kunnasranta, John R. Moran, Micaela Ponce, Douglas Wartzok, and Peter Boveng. Seasonal Home Ranges and Fidelity to Breeding Sites among Ringed Seals. (accepted to Polar Biology 15 March 2010)

Swanson, B., B. Kelly, C. Maddox, and J.R. Moran. 2006. Shed seal skin as a source of DNA molecular. Molecular Ecology Notes.

Wilson C., J.R. Moran, and R. Mac Donald. Pacific walruses (Odobenus rosmarus divergens) falling from cliffs in southwestern Alaska. In review for Marine Mammal Science.

Kelly, B., O. Badajos, M. Kunnasranta and J. Moran. 2005. Timing and re-interpretation of ringed seal surveys. Final report to Coastal Marine Institute, University of Alaska Fairbanks.

Lisac, M. and J.R. Moran 1999. Migratory and seasonal distribution of Dolly Varden Salvelinus malma in the Togiak River watershed, Togiak National Wildlife Refuge. Progress report 1999. USFWS report, 28 pp. Dillingham, AK.

Wilson C. and J. Moran. 1997. Abundance and distribution of marine mammals in northern Bristol Bay and southern Kuskokwim Bay-a status report of the marine mammal monitoring effort at Togiak NWR. Annual report 1997. USFWS report, 33 pp. Dillingham, AK.

Haggblom, L., and J. Moran 1995. The status of kittiwakes, murres, and cormorants at Cape Peirce, Bristol Bay, Alaska, Summer 1994. USFWS report, 14 pp. Dillingham, AK.
Haggblom, L., and J. Moran. 1994. The status of kittiwakes, murres, and cormorants at Cape Peirce, Bristol Bay, Alaska, Summer 1993. USFWS report, 20 pp. Dillingham, AK.

Brendan P. Kelly, Oriana H. Badajos, Mervi Kunnasranta, John R. Moran, Micaela Ponce, Douglas Wartzok, and Peter Boveng. Seasonal Home Ranges and Fidelity to Breeding Sites among Ringed Seals.

RECENT COLLABORATORS:
Mary Anne Bishop, Prince William Sound Science Center, Cordova, AK
Janice Straley, University of Alaska Southeast, Sitka AK.

Brendan Kelly, University of Alaska Southeast, Juneau, AK
Mervi Kunnasranta, University of Joensuu, Joensuu, Finland
Peter Boveng, Polar Ecosystem Program, NMML, NMFS, Seattle, WA
Lois Harwood, Department of Fisheries and Oceans Canada, Yellowknife, NT, Canada
Tom Smith, EMC EcoMarine Corporation,Quebec, Canada
Rex Snyder, Nanuuq Commission, Anchorage, AK

John F. Piatt

Curriculum Vitae

Research Biologist (GS-15), Marine Ecology Project Leader, Alaska Science Center, U.S. Geological Survey, 4210 University Drive, Anchorage, Alaska, U.S.A. 99508.
Current mailing address: USGS Marrowstone Marine Station, 616 Marrowstone Point Road, Nordland WA 98358-9633 1° Work ph: (360) 774-0516; Fax (360) 385-7207
E-mail: john_piatt@usgs.gov Web:
http://www.absc.usgs.gov/research/seabird_foragefish/index.html

ACADEMICS:

Affiliate Professor, School of Aquatic and Fisheries Sciences, University of Washington, Seattle.

Ph.D., Marine Biology, 1987, Department of Biology, Memorial University of Newfoundland, St. John's, Canada. Thesis: Behavioural Ecology of Common Murre and Atlantic Puffin Predation on Capelin: Implications for Population Biology.

B.Sc. (Hons.) Biochemistry, 1977, Memorial University of Newfoundland, St. John's, Canada.

RECENT RESEARCH EXPERIENCE

Endangered Species Studies (2001-2010). Principal Investigator for studies on rare and threatened seabirds in Alaska, including Kittlitz's Murrelet, Marbled Murrelet and Short-tailed Albatross. Studies include surveys for distribution and abundance in Southeast Alaska, Gulf of Alaska, Bering Sea and Aleutian islands, detailed investigations of marine ecology and habitat use, radio telemetry, physiology, etc.

Glacier Bay Marine Ecosystem Studies (1999-2005). Principle Investigator for studies on oceanography, zooplankton, forage fish (using hydroacoustics, seines, trawls) and marine predators (seabirds, marine mammals) in Glacier Bay National Park (including 4 year inventory of all fish species in the park, study of Humpback Whale foraging behavior, and investigations of murrelet ecology).

Functional Response of Seabirds to their Prey in Cook Inlet (1995-2001). Principal Investigator of long-term, integrated study of oceanography, forage fish (seining, trawling, hydroacoustics), and seabirds (diets, stress, energetics, breeding, foraging behavior, genetics, annual survival) around three seabird colonies in lower Cook Inlet.

Participant in 38 research cruises in 1977-2010 to study oceanography, plankton, forage fish and seabirds in the North Atlantic, Labrador Sea, eastern Canadian Arctic, North Central Pacific, Gulf of Alaska, Aleutians, Bering Sea and Chukchi Sea.

OTHER ACTIVITIES

Contributing Editor, Marine Ecology Progress Series (2007- current)

Associate Editor, *The Auk* (2006 – current)

Science Panel, North Pacific Research Board, Anchorage, Alaska (2005-2011)

Past or Current advisor and/or graduate committee member for: A. Agness *U. Washington*; S. Speckman, *U. Washington*.; M. Romano, *Oregon State U.*; M. Robards, *Memorial U. Newfoundland*; T. Van Pelt, *U. Glasgow*; M. Litzow, *U. California, Santa Cruz*; A. Kitaysky, *U. Washington*; Ann Harding, *Sheffield U.;* K. Kuletz, *U. Victoria,* S. Zador, *U. Washington,* M. Renner*, U. Washington,* Mayumi Arimitsu, *U. Alaska, Fairbanks*, J. Lawonn, *Oregon State U.*, J. Cragg, *U. Victoria*.

SELECTED PUBLICATIONS:

Drew, G., D. Dragoo, M. Renner, J. Piatt. 2010. Effects of the Kasatochi volcano eruption of 2008 on the abundance and distribution of seabirds at sea. Arctic, Antarctic, & Alpine Research 42:325-334.

Piatt, J.F., M.L. Arimitsu, G. Drew, E. Madison, M.D. Romano. 2010. Status and trends of Kittlitz's and Marbled Murrelet in Glacier Bay. Marine Ornithology (in press).

Shultz, M.T., J.F. Piatt, A.M. A. Harding, A.B. Kettle, T.I. Van Pelt. 2009. Timing of breeding and reproductive performance in murres and kittiwakes reflect mismatched seasonal prey dynamics. Marine Ecology Progress Series 393: 247-258.

Regular, P.M., F. Shuhood, T. Power, W. A. Montevecchi, G. J. Robertson, D. Ballam, J. F. Piatt and B. Nakashima. 2009. Murres, Capelin and Ocean Climate: Inter-annual Associations across a Decadal Shift. Environmental Monitoring and Assessment, 156: 293-302.

Renner, M., G.L.Hunt Jr, J.F. Piatt and G.V. Byrd. 2008. Seasonal and distribution patterns of seabirds along the Aleutian Archipelago. Marine Ecology Progress Series. 357: 301-311.

Arimitsu, M.L., J.F. Piatt, M.A. Litzow, A.A. Abookire, M.D. Romano, Martin Robards. 2008. Cold water refugia: glacial influence on the distribution and spawning dynamics of Pacific capelin (*Mallotus villosus*). Fisheries Oceanography 17: 137-146.

Piatt, J.F., K.J. Kuletz, A.E. Burger, S.A. Hatch, V.L. Friesen, T.P. Birt, M.L. Arimitsu, G.S. Drew, A.M.A. Harding and K.S. Bixler. 2007. Status Review of the Marbled Murrelet (*Brachyramphus marmoratus*) in Alaska and British Columbia: U.S. G.S. Open-File Report 2006-1387, 258pp.

Piatt, J.F., A.M.A. Harding, M. Shultz, S.G. Speckman, T. I. van Pelt, G.S. Drew, A.B. Kettle. 2007. Seabirds as indicators of marine food supplies: Cairns revisited. Marine Ecology Progress Series 352: 221-234.

Kitaysky, A.S., J. F. Piatt and J.C. Wingfield. 2007. Stress hormones link food availability and population processes in seabirds. Marine Ecology Progress Series 352: 245-258.

Piatt, J.F., and A.M.A. Harding. 2007. Population Ecology of Seabirds in Cook Inlet. Pp. 335-352 *in*: Robert Spies (ed.), Long-term Ecological Change in the Northern Gulf of Alaska. Elsevier, Amsterdam.

Piatt, J.F., and A.M. Springer. 2007. Marine ecoregions of Alaska. Pp. 522-526 *in*: Robert Spies (ed.), Long-term Ecological Change in the Northern Gulf of Alaska. Elsevier, Amsterdam.

Harding, A.M.A., Piatt, J.F., Schmutz, J.A., Shultz, M.T., Van Pelt, T.I., Kettle, A.B., and Speckman, S.G. 2007. Prey density and the behavioral flexibility of a marine predator: the Common Murre (*Uria aalge*). Ecology 88: 2024-2033.

Speckman, S., J.F. Piatt, C. Minte-Vera and J. Parrish. 2005. Parallel structure among environmental gradients and three trophic levels in a subarctic estuary. Progress in Oceanography 66: 25-65.

Piatt, J.F., J. Wetzel, K. Bell, A. DeGange, G. Balogh, G. Drew, T. Geernaert, C. Ladd, G.V. Byrd. 2005. Predictable hotspots and foraging habitat of the endangered short-tailed albatross (*Phoebastria albatrus*) in the North Pacific: Implications for conservation. *Deep Sea Research* II 53: 387-398.

Litzow, M.A., J.F. Piatt, A.A. Abookire, and M. Robards. 2004. Energy density and variability in abundance of pigeon guillemot prey: support for the quality-variability tradeoff hypothesis. Journal of Animal Ecology 73: 1149-1156.

Abookire, A.A. and J.F. Piatt. 2005. Oceanographic conditions structure forage fishes into lipid-rich and lipid-poor communities in lower Cook Inlet, Alaska, USA. Marine Ecology Progress Series 287: 229-240.

COLLABORATORS

During the past four years, I have collaborated with the following on proposals and papers (including only PI's I have worked with directly): Jim Bodkin (USGS), G. Vernon Byrd (USFWS), Anthony DeGange (USGS), Vicki Friesen (Queen's Univ.), Shelley Hall (NPS), Ann Harding (Alaska Pacific Univ.), George Hunt (Univ. Washington), David Irons (USFWS), Michelle Kissling (USFWS), Alexander Kitaysky (Univ. Alaska, Fairbanks), Kathy Kuletz (USFWS), Bill Montevecchi (Memorial Univ.), Julia Parrish (Univ. Washington), Bill Pyle (USFWS), Martin Renner (U. Wash.), Dan Roby (Oregon State Univ.), Suzann Speckman (USFWS), William Sydeman (Farallon Institute).

Resume for Stanley D. Rice [Feb 2011]

NOAA Fisheries, Alaska Fisheries Science Center
Auke Bay Laboratories as TSMRI
17109 Point Lena Loop Road, Juneau, Alaska 99801-8626.
Ph. 907-789-6020, fax 907-789-6094, e-mail jeep.rice@noaa.gov.

Expertise: Toxicology: Oil effects, oil chemistry, embryo toxicology, chemical and biological biomarkers, pollutants in Alaska, Risk and oil development in the Arctic;; ShoreZone use..

Forage fish biology: herring biology, humpback whale predation on herring, energetics of forage fish, comparative biology

Program Management: 30 plus years of program management, including integration of chemistry, biology, budgets, personnel, team building.

EDUCATION

B.S. 1966, Biological Science; Chico State University, Chico, California
M.S., 1968, Biological Science; Chico State University, Chico, California
Ph.D., 1971, Physiology; Kent State University, Kent, Ohio

PROFESSIONAL EXPERIENCE

1971-present, Marine Biologist/Toxicologist at Auke Bay Laboratory, Juneau Alaska
1986- present, Program Manager, Habitat and Marine Chemistry at the Auke Bay Laboratory, Alaska Fisheries Science Center

- Program Leader, Habitat Alaska Fisheries Science Center.
  Oversee tasks ranging from ShoreZone habitat mapping of nearshore to long term impact studies of natural environmental change, ecosystem change through energetics, to energetics of prey and marine mammal response to changes in forage, to contaminant impacts on species and ecosystems; Genetics task
- Principal investigator for specific tasks on the Exxon Valdez
  Damage assessment studies in the early years of the spill, on herring and pink salmon, and intertidal zone. Long term studies tracking oil persistence, and connecting persistence with chronic effects to intertidal zone fauna, pink salmon, herring, Sea Otters, and Harlequin Ducks.
- Principal Investigator on OCSEAP studies in the 1970-early 1980s, dealing with toxicity research themes
- Principal Investigator for Evironmental Impact Statement on TransAlaska Pipeline in early 1970s
- Herring steering committee for EVOS; lead drafter of herring restoration plan for EVOS

1975-present, Affiliate Professor, University of Alaska Fairbanks, Juneau Center, School of Fisheries and Ocean Sciences.
1990- present; serving on the Science Board for the Oil Spil Recovery Institute in

Cordova (funded organization through the Oil Spill Pollution act of 1990
1974-present; testified at State and National legislative levels of various contaminant legistlation issues: (Kachemak buy back, double hull tankers, Tri-butyl tin restrictions, OPA 90, water quality implementation, OPA 90 renewal, and EVOS "re-opener" resolutions).
1993-96: lead editor organizing and publishing the first Trustee sponsored symposium proceedings of Exxon Valdez effects
Contributed to three NRC reviews of oil effects.
Published in Science: Peterson, C. H., S. D. Rice, J. W. Short, D. Esler, J. L. Bodkin, B. E.Ballachey, and D. B. Irons. 2003. Long-term ecosystem response to the Exxon Valdez oil spill. **Science 302: 2082-2086.**

Some Recent Publications since 2000:

(Over 140 peer reviewed journal manuscripts published since 1972)

Blanc, A.M., L.G. Holland, S.D.Rice, and C.J.Kennedy. 2010. Anthropogenicallly sourced low concentrations of PAHS: in situ bioavailability to juvenile Pacific salmon. Ecotox. & Enviorn. Safety. 73:849-857.
Rice, Stanley D. 2009. Persistence, Toxicity, and long term environmental impacts of the Exxon Valdez Oil spill. Univ. St. Thomas Law School Jounal 7: 55-67.

Matkin, D.O., E.L., Saulities, G.M. Ellis, and S.D. **Rice.** 2008 Press. Population level impacts on killer whale eighteen years following the Exxon Valdez Oil Spill. Marine Ecology Progress Series 356:269-281.

Rice, Stanley D., Larry Holland, and Adam Moles. 2006. Seasonal increases in polycyclic aromatic hydrocarbons related to two-stroke engine use in a small Alaskan lake. Journal of Lake and Reservoir Management

Rice, Stanley and Adam Moles. 2006. Assessing the potential for remote delivery of persistent organic pollutants to the Kenai River in Alaska. Alaska Fishery Research Bulletin 12(1): 142-146.

Rice, Stanley D., Jeffrey W. Short, Mark G. Carls, Adam Moles, and Robert B. Spies. 2007. The Exxon Valdez oil spill. Chapter 5. pp. 413-514 In: R. B. Spies, T. Cooney, A.M. Springer, T. Weingartner, and G. Kruse (eds.), Long-term Ecological Change in the Northern Gulf of Alaska. Elsevier Publications, Amsterdam.

Thomas, R. E., M. Lindeberg, P. M. Harris, and S. D. **Rice**. 2007. Induction of DNA strand breaks in the mussel (Mytilus trossulus) and clam (Protothaca staminea) following chronic field exposure to polycyclic aromatic hydrocarbons from the Exxon Valdez spill. Mar. Poll Bull. 54: 726-732.

Short. J. W., G. V. Irvine, D. H. Mann, J. M. Maselko, J. J. Pella, M. R. Lindeberg, J. R. Payne, W. B. Driskell, and S. D. Rice. 2007. Slightly weathered *Exxon Valdez* oil persists in Gulf of Alaska beach sediments after 16 years. Environ. Sci. Technol. 41:1245-1250.

Short, J.W., J.M. Maselko, M.R. Lindeberg, P.M. Harris, and S.D. Rice. 2006. Vertical distribution and probability of encountering intertidal *Exxon Valdez* oil on shorelines of three embayments within Prince William Sound, Alaska. Envior. Sci. and Tech. 40: xx-xx.

Carls, M.G., R.A. Heintz, G.D. Marty, and S.D. Rice. 2005. Cytochrome P4501A induction in oil-exposed pink salmon Oncorhynchus gorbuscha embryos predicts reduced survival potential. Marine Ecology Progress Series 301: 253-265.

Barron. M.G., M.G. Carls, R.A. Heintz, and S.D. Rice. 2004. Evaluation of fish early life-stage toxicity models of chronic embryonic exposures to complex polycyclic aromatic hydrocarbon mixtures. Toxicological Sciences 78: 60-67.

Carls, M.G., P.M. Harris, and S.D. Rice. 2004. Restoration of oiled mussel beds in Prince William Sound, Alaska. Marine Environmental Research 57: 359-376.

Carls. M.G., L.G. Holland, J.W. Short, R.A. Heintz, and S.D. Rice. 2004. Monitoring polynuclear aromatic hydrocarbons in aqueous environments with passive low-density polyethylene membrane devices. Environmental Toxicology and Chemistry 23(6): 1416-1424.

Carls. M.G., S.D. Rice, G.D. Marty, and D.K. Naydan. 2004. Pink salmon spawning habitat is recovering a decade after the Exxon Valdez oil spill. Transactions of the American Fisheries Society 133: 834-844.

Short, J. W., M. R. Lindeberg, P. M. Harris, J. M. Maselko, J. J. Pella, and S. D. Rice. 2004. Estimate of oil persisting on beaches of Prince William Sound, 12 after the Exxon Valdez oil spill. Environmental Science and Technology 38(1): 19-25.

Peterson, C. H., S. D. Rice, J. W. Short, D. Esler, J. L. Bodkin, B. E.Ballachey, and D. B. Irons. 2003. Long-term ecosystem response to the Exxon Valdez oil spill. **Science 302: 2082-2086.**

Rice, Stanley D. , Robert E. Thomas, Ronald A. Heintz, Alex C. Wertheimer, Michael L. Murphy, Mark G. Carls, Jeffrey W. Short, and Adam Moles. 2001. Impacts to pink salmon following the *Exxon Valdez* oil spill: persistence, toxicity, sensitivity, and controversy. Reviews in Fishery Science 9 (3): 165-211.

Rice, Stanley, D., Jeff W. Short, Ron A. Heintz, Adam Moles, Robert E. Thomas. 2001. Oil and gas issues in Alaska: lessons learned about long-term toxicity following the *Exxon Valdez* oil spill. Pp. 91-97 In: Exploring the Future of Offshore Oil and Gas Development in BC: Lessons from the Atlantic. Continuing Studies in Science at Simon Fraser University, Burnaby, British Columbia.

Heintz, R.A., S.D. Rice, A.C. Wertheimer, R.F. Bradshaw, F.P. Thrower, J.E. Joyce, and J.W. Short. 2000. Delayed effects on growth and marine survival of pink salmon

Oncorhynchus gorbuscha after exposure to crude oil during embryonic development. Mar. Ecol. Prog. Ser. 208: 205-216.

Rice, Stanley D., Jeffrey W. Short, Ron A. Heintz, Mark G. Carls, and Adam Moles. 2000. Life history consequences of oil pollution in fish natal habitat. Pp. 1210-1215 In: Peter Catania (ed.), Energy 2000: The Beginning of a New Millennium. Technomic Publications.

THOMAS J. WEINGARTNER

EDUCATION

Ph.D. Physical Oceanography, 1990, North Carolina State University
M.S. Physical Oceanography, 1980, University of Alaska
B.S. Biology, 1974, Cornell University

MEMBERSHIPS

American Geophysical Union; American Meteorological Society

SYNERGISTIC ACTIVITIES

National

Guest Co-Editor, Deep-Sea Research Special Issue on Northeast Pacific GLOBEC Program
Member, Organizing Committee, 2005 Gordon Conference on Coastal Oceanography
Past Member, Science and Technology Advisory Committee, Gulf Ecosystem Monitoring Program, 2002 – 2004
Past Member, GLOBEC Northeast Pacific Executive Committee, 2000 - 2003
Past Member, Science Steering Committee, NSF - Arctic System Science-Ocean Atmosphere Ice Interaction (OAII) Shelf-Basin Interaction Project (2/98 - 2/03).
Past Member, Science Steering Committee, NSF - ARCSS-OAII Shelf-Basin Interactions (1995 -2002)
Past Member, UNOLS Fleet Improvement Committee (1994 – 1998)

State of Alaska

Member, Science Advisory Committee, Prince William Sound Science Center, Cordova, Alaska (2006 – 2008).

University of Alaska

Chair IMS Ship Committee (1994 – present); Member, IARC Program Advisory Committee (2004 – present); Member, Chapman Chair Search Committee (2004-2005); Member, Science Steering Committee, Center for Global Change (2003 – 2006); Chair, IMS/SFOS Faculty Search Committee (2006 and continuing); Chair (Academic Coordinator), Graduate Program in Marine Science and Limnology, SFOS

PROFESSIONAL EXPERIENCE

Professor, Institute of Marine Science (IMS), School of Fisheries and Ocean Sciences (SFOS), U. of Alaska Fairbanks (UAF), Alaska; 7/01 – present
Associate Professor; IMS/SFOS/UAF 6/99 – 6/07
Assistant Professor; IMS/SFOS/UAF 11/93 - 1999
Research Associate; IMS/SFOS/UAF 9/91 - 10/93
Postdoctoral Student; IMS/SFOS/UAF 7/88 - 8/91
Graduate Research Assistant; Department of Marine, Earth and Atmospheric Sciences, North Carolina State U.; Raleigh, North Carolina; and Department of Marine Science, U. of South Florida; St. Petersburg, Florida; 8/84 - 10/88

REFEREED PUBLICATIONS (FIVE RELEVANT)

1. Janout, M.A, T. J. Weingartner, T. Royer, and S. Danielson. 2010. On the nature of winter cooling and the recent temperature shift on the northern Gulf of Alaska shelf, *Journal of Geophysical Research*, 115, C05023, doi:10.1029/2009JC005774

2. Williams, W. J., T. J. Weingartner, and A. J. Hermann. 2010. Idealized 2-dimensional modeling of a coastal buoyancy front, or river front, under downwelling-favourable wind-forcing with application to the Alaska Coastal Current, *Journal of Physical Oceanography,* 40: 279-294.

3. Janout, M. A., T. J. Weingartner, S. R. Okkonen, T. E. Whitledge, and D. L. Musgrave. 2009. Some characteristics of Yakutat Eddies propagating along the continental slope of the northern Gulf of Alaska, accepted to *Deep-Sea Research*, Part II. 56(24): 2444-2459, doi:10.1016/j.dsr2.2009.02.006.

4. Williams, W., T. J. Weingartner, and A. Hermann, 2007. Idealized 3-dimensional modeling of seasonal variation in the Alaska Coastal Current. *Journal of Geophysical Research*, 112, C07001; doi:10.1029/2005JC003285.

5. Weingartner, T.J., The Physical Environment of the Gulf of Alaska (Section 2.2, p 12 – 47), IN: Long-Term Ecological Change in the Northern Gulf of Alaska, edited by R. B. Spies, Elsevier B.V., Amsterdam, 589 p., 2007.

FIVE OTHER:

6. Yankovsky, A. E., G. M. Maze, and T. J. Weingartner, 2010. Offshore transport of the Alaska Coastal Current water induced by a cyclonic wind field, *Geophysical Research Letters,* 37, L03604, doi:10.1029/2009GL041939
7. Rogers-Cotrone, J, A. Yankovsky, and T. J. Weingartner. 2008. The impact of spatial wind variations on freshwater transport by the Alaska Coastal Current, *Journal of Marine Research*, 66(6): 899-827.
8. Weingartner, T.J., S. Danielson, and T. C. Royer. 2005. Freshwater Variability and Predictability in the Alaska Coastal Current *Deep-Sea Research*, 52: 169 – 192.
9. Okkonen, S., Weingartner, T.J., S. Danielson, D. L. Musgrave, and G. M. Schmidt. 2003. Satellite and hydrographic observations of eddy-induced shelf-slope exchange in the northwestern Gulf of Alaska *J. Geophysical Research* 108: 15 –1, 15 –10Weingartner, T.J., Long-Term Change: Atmosphere and Ocean (Section 4.2, p 265 – 27347), IN: Long-Term Ecological Change in the Northern Gulf of Alaska, edited by R. B. Spies, Elsevier B.V., Amsterdam, 589 p.
10. Aagaard, K., T.J. Weingartner, S.L. Danielson, R.A. Woodgate, G.C. Johnson, and T.E. Whitledge, Some controls on flow and salinity in Bering Strait, *Geophysical Research Letters*, *33*, L19602, doi:10.1029/2006GL026612, 2006.

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Financial Statements and Supplementary Information

Year Ended September 30, 2009

(With Independent Auditor's Report Thereon)

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Table of Contents

Mikunda,
Cottrell & Co., Inc.
Certified Public Accountants & Consultants

RSM McGladrey Network
An Independently Owned Member

Offices in Anchorage & Kenai

Independent Auditor's Report

The Board of Directors
Prince William Sound Science and Technology Institute
(d.b.a. Prince William Sound Science Center)
Cordova, Alaska

We have audited the accompanying statement of financial position of Prince William Sound Science and Technology Institute (d.b.a. Prince William Sound Science Center) as of September 30, 2009, and the related statements of activities and cash flows for the year then ended. These financial statements are the responsibility of the Prince William Sound Science Center's management. Our responsibility is to express an opinion on these financial statements based on our audit. The prior year summarized comparative information has been derived from the Prince William Sound Science Center's 2009 financial statements, and in our report dated February 13, 2009, we expressed an unqualified opinion on those financial statements.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards,* issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and the significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of Prince William Sound Science Center as of September 30, 2009, and the changes in its net assets and its cash flows for the year then ended in conformity with accounting principles generally accepted in the United States of America.

In accordance with *Government Auditing Standards,* we have also issued our report dated February 4, 2010 on our consideration of Prince William Sound Science Center's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on the internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* and should be considered in assessing the results of our audit.

3601 "C" Street, Suite 600 • Anchorage, Alaska 99503 • (907) 278-8878 • Fax (907) 278-5779 • www.mcc-cpa.com

The Board of Directors
Prince William Sound Science and Technology Institute
(d.b.a. Prince William Sound Science Center)

Our audit was conducted for the purpose of forming an opinion on the basic financial statements taken as a whole. The supplementary information included on pages 18-27 is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the audit of the basic financial statements and, in our opinion, is fairly stated, in all material respects, in relation to the basic financial statements taken as a whole.

Mikunda, Cottrell & Co.

Anchorage, Alaska
February 4, 2010

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Statement of Financial Position
September 30, 2009
(With Comparative Totals for 2008)

	General Fund	Plant Fund	Program Funds	Totals 2009	Totals 2008
Assets					
Current assets:					
Cash and cash equivalents	$ 68,477	-	109,412	177,889	173,353
Receivables:					
Trade	369	-	-	369	7,892
Interest receivable	-	-	-	-	8,155
Federal grants	-	-	229,184	229,184	305,433
Other grants	-	-	4,800	4,800	57,733
Prepaids and other assets	51,546	-	-	51,546	58,635
Due from other funds	260,903	-	31,806	292,709	501,338
Leasehold, current portion	18,000	-	-	18,000	18,000
Total current assets	399,295	-	375,202	774,497	1,130,539
Investments	-	-	2,148,730	2,148,730	2,125,430
Leasehold, long-term portion	1,500	-	-	1,500	19,500
Property and equipment, net of accumulated depreciation	-	832,548	-	832,548	767,442
Total assets	$ 400,795	832,548	2,523,932	3,757,275	4,042,911
Liabilities and Net Assets					
Liabilities:					
Accounts payable	152,827	-	-	152,827	317,276
Wages, taxes and benefits payable	147,023	-	-	147,023	119,235
Deferred revenue	20,861	-	623,347	644,208	641,474
Due to other funds	31,806	-	260,903	292,709	501,338
Total liabilities	352,517	-	884,250	1,236,767	1,579,323
Net assets:					
Temporarily restricted	19,500	-	-	19,500	37,500
Unrestricted	28,778	832,548	1,639,682	2,501,008	2,426,088
Total net assets	48,278	832,548	1,639,682	2,520,508	2,463,588
Total liabilities and net assets	$ 400,795	832,548	2,523,932	3,757,275	4,042,911

See accompanying notes to financial statements.

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Statement of Activities

Year Ended September 30, 2009

(With Comparative Totals for 2008)

	General Fund	Plant Fund	Program Funds	Totals 2009	Totals 2008
Revenues:					
Grants and contributions:					
Federal	$ -	-	2,467,376	2,467,376	2,875,325
Other	55,737	-	193,070	248,807	359,943
Total grants and contributions	55,737	-	2,660,446	2,716,183	3,235,268
Interest income	249	-	3,202	3,451	10,713
Investment income (loss)	-	-	67,195	67,195	(47,948)
Total revenues	55,986	-	2,730,843	2,786,829	3,198,033
Net assets released from restrictions due to passage of time	18,000	-	-	18,000	18,000
Total unrestricted revenues	73,986	-	2,730,843	2,804,829	3,216,033
Expenses:					
Salaries and benefits	266,190	-	1,029,342	1,295,532	1,351,138
Travel	37,330	-	68,924	106,254	101,794
Professional services	37,704	-	75,166	112,870	76,161
Subcontracts and charter costs	300	-	436,057	436,357	593,314
Supplies	6,749	-	48,582	55,331	62,912
Telephone	3,641	-	13,862	17,503	10,166
Postage and freight	2,955	-	4,395	7,350	9,991
Printing, publications and copying	15,397	-	9,308	24,705	25,087
Facilities and rent expense	31,879	-	911	32,790	40,350
Utilities	14,571	-	8,651	23,222	30,344
Insurance	30,720	-	2,694	33,414	30,921
Equipment rental and maintenance	12,650	-	19,652	32,302	71,574
Advertising	1,551	-	823	2,374	2,166
Other	15,173	-	8,614	23,787	15,829
Grants awarded	-	-	338,532	338,532	755,138
Amortization and depreciation	-	187,586	-	187,586	151,343
Total expenses before interfund facility and equipment costs and indirect costs (reimbursement)	476,810	187,586	2,065,513	2,729,909	3,328,228
Interfund facility and equipment costs (reimbursement)	(20,775)	-	20,775	-	-
Indirect costs (reimbursement)	(330,104)	-	330,104	-	-
Total expenses	125,931	187,586	2,416,392	2,729,909	3,328,228
Increase (decrease) in unrestricted net assets	(51,945)	(187,586)	314,451	74,920	(112,195)
Decrease in temporarily restricted net assets - net assets released from restriction	(18,000)	-	-	(18,000)	(18,000)
Change in net assets	(69,945)	(187,586)	314,451	56,920	(130,195)
Net assets at beginning of year	126,859	767,442	1,569,287	2,463,588	2,593,783
Transfers from General Fund and Program Funds	-	252,692	-	252,692	117,414
Transfers to Plant Fund	(8,636)	-	(244,056)	(252,692)	(117,414)
Net assets at end of year	$ 48,278	832,548	1,639,682	2,520,508	2,463,588

See accompanying notes to financial statements.

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Statement of Cash Flows
Year Ended September 30, 2009
(With Comparative Totals for 2008)

	General Fund	Plant Fund	Program Funds	Totals 2009	Totals 2008
Cash flows from operating activities:					
Change in net assets	$ (69,945)	(187,586)	314,451	56,920	(130,195)
Adjustments to reconcile change in net assets to net cash provided (used) by operating activities:					
Amortization and depreciation	-	187,586	-	187,586	151,343
(Gains) losses on investments	-	-	(19,847)	(19,847)	106,660
(Increase) decrease in assets:					
Accounts receivable	7,523	-	-	7,523	(1,465)
Grants receivable	-	-	129,182	129,182	(55,817)
Prepaids and other assets	7,089	-	-	7,089	(2,528)
Due from other funds	219,246	-	(10,617)	208,629	(64,381)
Interest receivable	-	-	8,155	8,155	(269)
Leasehold	18,000	-	-	18,000	18,000
Increase (decrease) in liabilities:					
Accounts payable	(164,449)	-	-	(164,449)	86,324
Wages, taxes and benefits payable	27,788	-	-	27,788	(232)
Deferred revenue	(3,072)	-	5,806	2,734	51,494
Due to other funds	10,617	-	(219,246)	(208,629)	64,381
Net cash provided by operating activities	52,797	-	207,884	260,681	223,315
Cash flows from investing activities:					
Purchase of investments	-	-	(705,744)	(705,744)	(760,057)
Proceeds from maturities of investments	-	-	702,291	702,291	775,438
Additions to property and equipment	(8,636)	-	(244,056)	(252,692)	(117,414)
Net cash provided (used) by investing activities	(8,636)	-	(247,509)	(256,145)	(102,033)
Net increase (decrease) in cash	44,161	-	(39,625)	4,536	121,282
Cash at beginning of year	24,316	-	149,037	173,353	52,071
Cash at end of year	$ 68,477	-	109,412	177,889	173,353

See accompanying notes to financial statements.

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Notes to Financial Statements

September 30, 2009

(1) Organization and Summary of Significant Accounting Policies

Organization

Prince William Sound Science and Technology Institute (d.b.a. Prince William Sound Science Center) (Center) was formed in 1989 as an Alaska not-for-profit scientific research and education corporation to contribute to the comprehensive description, sustained monitoring and ecological understanding of Prince William Sound, the Copper River, and Gulf of Alaska. Establishment of the Center followed the Exxon Valdez oil spill although planning of this institution preceded that event. The underlying philosophy of the Center is to serve as a model for long-term ecosystem management. Operations are financed principally by public contributions and grants from industry and various governmental agencies.

Basis of Accounting

The financial statements of the Center have been prepared on the accrual basis of accounting and in accordance with policies consistent with those prescribed by the Audit and Accounting Guide for Not-for-Profit Organizations, issued by the American Institute of Certified Public Accountants. In order to ensure observation of limitations and restrictions placed on the use of resources available to the Center, the accounts are maintained in accordance with the principles of fund accounting. This is the procedure by which resources for various purposes are classified for accounting and reporting purposes into funds established according to their nature and purpose. As a result, the Center has adopted the following funds:

General – Accounts for the supporting services of the Center and all transactions not accounted for in the program funds or plant fund.

Plant – Accounts for the ownership of property and equipment and any associated debt.

Program – Accounts for expendable funds restricted by the donor, grantor or other outside party for a specific purpose or program.

Net assets and revenues, expenses, gains and losses are classified based on the existence or absence of donor-imposed restrictions. Accordingly, net assets of the Center and changes therein are reported as follows:

Unrestricted Net Assets – Net assets that are not subject to donor-imposed stipulations.

Organization and Summary of Significant Accounting Policies, continued

Basis of Accounting, continued

Temporarily Restricted Net Assets – Temporarily restricted resources are restricted by the donor, grantor or other outside parties whose restrictions either expire by the passage of time or can be fulfilled and removed by actions of the Center. Revenues associated with these resources are earned when the Center undertakes the necessary action or other restrictions are met. When a donor restriction expires, that is, when a stipulated time restriction ends or a purpose restriction is accomplished, temporarily restricted net assets are reclassified to unrestricted net assets and reported in the statement of activities as net assets released from restriction. Revenues associated with restricted contributions received during the reporting period which are met during the reporting period are recorded as unrestricted revenues.

Management Estimates

In preparing the financial statements, management is required to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the statement of financial position, and revenues and expenses for the period. Actual results could differ from those estimates and assumptions.

Support and Revenues

Operating moneys restricted by the grantor are deemed to be earned and reported as revenues when the Center has incurred costs in compliance with the specific restrictions. Such amounts received but not earned are reported as deferred revenue.

Indirect Costs

Indirect costs include overhead allocations for space, equipment, salaries, utilities, and certain other costs paid for by the General Fund and allocable to the program funds.

Investments

The Center records investments at fair value. On October 1, 2008, FASB Accounting Standards Codification (FASB ASC) 958.205 (formerly FAS157), Fair Value Measurements, went into effect at the Center. FASB ASC 958.205 defines fair value, establishes a hierarchy for measuring fair value in generally accepted accounting principles (GAAP), and expands disclosures about fair value measurements. The Statement requires that assets and liabilities carried at fair value to be classified and disclosed in one of the following three input categories:

Organization and Summary of Significant Accounting Policies, continued

Investments, continued

Level 1 – Quoted market prices in active markets for identical assets or liabilities.

Level 2 – Observable market based inputs or unobservable inputs that are corroborated by market data.

Level 3 – Unobservable inputs that are not corroborated by market data.

Property and Equipment

Field and office equipment and furnishings are recorded at cost or, in the case of donated property, at the estimated fair value on the date of receipt. Depreciation is calculated on a straight-line basis over the estimated useful lives of the assets. Leasehold improvements are carried at cost and are amortized on a straight-line basis over the life of the lease or life of the improvement, whichever is less. Property and equipment financed by certain grantors in the program funds remain the property of the grantor and as such are recorded as expenditures in the program funds. Expenditures for repairs and maintenance are charged to operations, as incurred.

Income Tax Status

The Center qualifies as a not-for-profit corporation under Section 501(c) (3) of the Internal Revenue Code and therefore, is not subject to federal or state income tax on its qualifying exempt activities.

Subsequent Events

Management of the Center has evaluated subsequent events through February 4, 2010, the date on which the financial statements were issued.

(2) **Program Classifications**

Program funds consist of the following:

Oil Spill Recovery Institute (OSRI)

This program funds the administration and awards of the Oil Spill Recovery Institute, a federally established program to improve technologies for prevention and response to oil pollution issues in the Arctic and Subarctic; and, also to investigate the environmental and socio-economic impact of oil spills in the Arctic and Subarctic marine environments. Beginning in 1997, funding is provided directly from the interest earnings on a $22.4 million fund administered by the U.S. Coast Guard (through the National Oil Spill Liability Trust Fund). The Institute is governed by an Advisory Board which includes representatives from Federal and State agencies, Alaska Native and Prince William Sound (PWS) community, and industry representatives appointed by the Governor of Alaska. The Advisory Board Chair is a U.S. Department of Commerce representative.

Program Classifications, continued

OSRI - Community Education Programs – Science of the Sound / Forest to the Sea

The Science of the Sound program has three major components: (1) the Discovery Room, a program which supplements elementary school science education in the community; (2) Summer Science Camp, "From the Forest to the Sea", offering residential camp sessions to ages 7-15 and families; and (3) Regional Outreach, a program that delivers science and environmental education to the remote communities of Prince William Sound. Funding for these programs come from OSRI, corporate and foundation donations, camp revenues, and a partnership program with the U.S. Forest Service, which provides in-kind donations of salaries and supplies.

Observational Oceanography

OSRI funds PWSSC for an observational oceanography program for multiple purposes. The primary sub-program of three is to provide an improved description of the flow through the straits connecting PWS with the Gulf of Alaska (GOA). This objective is a necessary step towards a better understanding of the relationship between circulation variability and biological variability in PWS. A second sub-program aims to acquire a description of the seasonal evolution of the hydrographic properties and circulation in the central basin of PWS. A third observational program aims at acquiring a better knowledge on the spatial and temporal variability of the effects of freshwater runoff in the near shore area of PWS.

2009 Field Experiment

OSRI is funding PWSSC Principal Investigators to conduct components of the Alaska Ocean Observing System (AOOS) 2009 Sound Predictions Experiment. This experiment will validate the ocean circulation, weather, wave, and biological models developed over the past six years. OSRI supported components include the NPZ Model Evaluation, Marine and Bird Surveys and additional field support.

PWSSC Fellowships

Three OSRI funded fellowships for PWSSC Biological Researchers were conducted this year. 1) to identify Forage Fish Habitat near Alaskan coastal shelf areas in the Beaufort and Chukchi seas, 2) to develop a plan for creating a synthesis of ecological research related to Prince William Sound, and 3) support "Tracking Movements of Lingcod in PWS using Acoustic Tags and Arrays". This is a matching award to a Pacific Coast Shelf Tracking (POST) project.

Balloon Experiment

OSRI is funding the PWSSC to conduct a "Demonstration of a tethered balloon surveillance spill detection system". A balloon-based visible and infrared surveillance system was purchased and tested to demonstrate its usefulness in Arctic and Sub-Arctic area's for oil spill monitoring.

Program Classifications, continued

Herring Ocean

This is an EVOS Trustee Council funded study to address the "physical oceanographic factors affecting productivity in juvenile Pacific Herring nursery habitats" in Prince William Sound. This study will build upon past research and also provide a physical context for a suite of proposed biological sampling. This is year three of a 3 year study by the EVOSTC.

Herring Thorne

This is an EVOS Trustee Council funded project to conduct surveys on abundance, distribution and condition of key herring life stages in Prince William Sound as a basis for restoration. This study allows for additional field work to monitor barometers of the PWS herring populations. This will add another dimension to the herring overwintering work currently being done at PWSSC. This is year three of a 3 year study by the EVOSTC.

Herring Forage

This is an EVOS Trustee Council funded project to study herring recruitment contingent on young herring attaining from zooplankton sufficient energy content to survive the first winter. Juvenile herring will be sampled and natural stable isotope abundance for comparison with prior SEA data. This is year three of a 3 year study by the EVOSTC.

Seabird Predation

This is an EVOS Trustee Council funded study awarded to the U.S. Fish & Wildlife Service and the PWSSC for Seabird Predation on Juvenile Herring in Prince William Sound during the winter months. This is year two of a potential 3 year study that when completed will aid in planning future restoration efforts from the Exxon Valdez Oil Spill as well as help assess the role of seabird predation on herring recruitment.

AOOS - Alaska Ocean Observing System

This project, funded by NOAA via the Alaska Ocean Observing System will include the purchase and installation of SNOTEL gauges for Meteorological and Precipitation Data, additional equipment for oceanographic moorings in PWS, and for installation of telemetry equipment for the Copper River Stream gauge. PWSSC will also conduct Thermosalinograph surveys and Mooring enhancements to measure biophysical coupling at Hinchinbrook Entrance and Montague Straits.

Community Ed: EPA/ NFWF/NPRB

PWSSC Community Education projects funded by additional sources for student education include: 1) Environmental Protection Agency (EPA) for Cordova Clean Oceans Project, 2) National Fish and Wildlife Foundation (NFWF) for the Discovery Monitoring Program for Marine Debris and Climate Change and 3) North Pacific Research Board (NPRB) for the Eyak Lake Community Monitoring Project to collect water quality data.

Program Classifications, continued

NPRB Bishop – Residency and Movements of Copper Rockfish

Funded by the NPRB and OSRI, the goal of this pilot project is to prove the efficacy of acoustic telemetry for documenting residency and movements of copper rockfish and lingcod in the near shore areas of Prince William Sound. Their use of near shore waters makes them vulnerable to oil spill events.

National Marine Fisheries Service (NMFS) PWS Sea Lion

This project, funded through National Marine Fisheries Service (NMFS) via a Congressional appropriation investigates the role of Pacific herring as important winter-period forage for Stellar Sea Lions. PWSSC has monitored the abundance of herring in PWS since 1993. Annual winter surveys of Herring conducted in PWS show that the numbers of foraging Stellar Sea Lions highly correlate to herring biomass. This project takes place in Prince William Sound and the Kodiak Archipelago.

NPS Long Lake Weir

The NPS is charged with monitoring natural resources that provide management with an indicator of the health of the ecosystem. The fish weir at Long Lake, Alaska, provides an opportunity to monitor an important salmon run in the Chitina River. This project is funded by NPS to the Center to assist the NPS with the management and operation of this fish weir to provide continuous historical salmon information.

Murdock Zooplankton

Funded by the M.J. Murdock Charitable Trust, this project supports PWSSC's work in collecting new, critical data on Zooplankton in PWS using a sophisticated Hydro-bios Multi-net system. Funding supports equipment purchase and salary for a post-doctoral technician to operate the new equipment.

NOAA Whittier Reef

This is a closing project grant funded by the NOAA to monitor the installation of a series of artificial reefs in the vicinity of Whittier, Alaska. PWSSC, in cooperation with the University of South Alabama, Dauphin Island Sea Lab will document the marine community at the artificial reef and will determine if artificial reef communities enhance the immediate marine environment.

ADF&G / Invasive Species

ADF&G provides some funds for PWSSC Logistic and Technical assistance to monitor Beluga Whales in Cook Inlet. ADF&G provides some funds for PWSSC to develop a cooperative program to monitor invasive species on the Copper River Delta. The program will collect scientific and local knowledge of invasive species in and around surveys on the western Copper River Delta and Orca Inlet.

Program Classifications, continued

POST – Lingcod

This project is funded by the Pacific Ocean Shelf Tracking (POST) Project. This is for work titled "Tracking Movements of Lingcod Ophiodon elongates in Prince William Sound using Acoustic Tags and Arrays: Expanding Local Infrastructure and Capacity." Acoustic tags are placed on lingcod in Prince William Sound. With the help of the Ocean Tracking Network (OTN), the tagged fish will then be monitored from acoustic arrays installed at the entrances to and selected bays in Prince William Sound and to detect lingcod movement in and out, and around the Sound. This project will use radio telemetry equipment upgrades funded by the Rasmuson Foundation.

Functional Expenses

Program Funds on the Statement of Activities is comprised of four functional project areas: OSRI, EVOS, Government, and Other Projects. Each functional area had the following expenses for each of the years ending September 30:

	2009	2008
OSRI	$ 930,038	1,335,410
EVOS	700,809	493,559
Government	605,869	950,522
Other	179,676	266,097
	$ 2,416,392	3,045,588

(3) **Cash**

Financial instruments that potentially subject the Center to concentrations of credit risk consist principally of cash deposits. Accounts are insured by the Federal Deposit Insurance Corporation (FDIC) up to $250,000 and $100,000 at September 30, 2009 and 2008, respectively. At September 30, 2009 and 2008, the Center had $0 and $81,814 respectively, in excess of FDIC insured limits.

(4) **Investments**

Investments held by the Center for the Oil Spill Recovery Institute program are held at fair value, and determined through Level 1 inputs as described under Investments in note 1. Investments consist of the following at September 30, 2009 and 2008:

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Notes to Financial Statements, continued

Investments, continued

	2009		2008	
	Cost	Fair Value	Cost	Fair Value
U.S. Treasury bills	$ 263,974	268,386	497,400	497,132
Corporate bonds	546,191	579,490	318,098	293,662
Certificates of deposit	1,526,337	1,300,854	1,464,359	1,334,636
	$ 2,336,502	2,148,730	2,279,857	2,125,430

Investments in equity securities are held through an investment broker. The broker is a member of the Securities Investor Protection Corporation (SIPC) established by Congress in 1970. If the broker-dealer fails, SIPC funds are available to make up any shortfall in client assets that the broker-dealer was required to maintain up to a maximum of $500,000 for securities, and inclusive of up to $100,000 of cash.

The Center's total investment balance which includes equity securities, debt securities, and cash and money market funds, which are included in cash and cash equivalents, and investments on the statement of financial position, was $2,220,283 and $2,159,934 at September 30, 2009 and 2008, respectively.

Investment income consisted of the following for the years ended September 30, 2009 and 2008:

	2009	2008
Interest and dividends	$ 92,631	64,148
Investment fees	(5,247)	(5,436)
Unrealized gain (loss)	13,156	(166,417)
Realized gain (loss)	(33,345)	59,757
	$ 67,195	(47,948)

(5) **Property and Equipment**

Property and equipment consisted of the following at September 30, 2009 and 2008:

	2009	2008
Property and equipment:		
Field equipment	$ 1,412,136	1,249,732
Office equipment	223,432	207,156
Furnishings	45,965	45,126
Leasehold improvements	538,966	538,966
	2,220,499	2,040,980
Accumulated depreciation	(1,387,951)	(1,273,538)
Property and equipment, net of accumulated depreciation	$ 832,548	767,442

(6) **Temporarily Restricted – Operating Lease**

The Center entered into a 10-year operating lease commencing November 2, 2000 with the City of Cordova for the building and dock that it occupies. The annual lease payment is $1. The estimated fair value of the remaining lease term is recorded as a temporarily restricted asset on the statement of financial position. The annual lease benefit is recorded as net assets released from restriction and facilities and equipment rent on the statement of activities At September 30, 2009 and 2008, the future lease benefit was estimated at $19,500 and $37,500, respectively. The lease benefit was estimated at $18,000 for each of the fiscal years 2009 and 2008.

(7) **Annuity Program**

The Center provides a qualified 403(b) plan to its employees. The plan, which is voluntary, allows employees to contribute up to 20% of their base salary, subject to Internal Revenue Service limitations, and requires the employer to match contributions up to 6% of a participant's base compensation. Employees are 100% vested in employer contributions after three years of service. Employer contributions were $34,121 and $35,167 for the years ended September 30, 2009 and 2008, respectively. The program's custodian is Nationwide Life Insurance Company.

(8) **Concentrations of Risk and Contingency**

The Center receives the majority of its funding through the Oil Spill Recovery Institute and the Exxon Valdez Oil Spill (EVOS) Trustee Council along with other state and federal government agencies. Changes in those agencies could have a detrimental effect on the Center's financial position.

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Notes to Financial Statements, continued

Concentrations of Risk and Contingency, continued

Expenditures made pursuant to grants and contracts are subject to audit by governmental agencies or their representatives. Management of the Center believes that no significant liabilities will result from any such audits and, accordingly, no provision for liability is included in the accompanying financial statements.

(9) Cash – Restricted and Unrestricted

	General Fund	Program Funds	Totals 2009	Totals 2008
Cash:				
Unrestricted	$ -	109,412	109,412	149,037
Temporarily restricted	68,477	-	68,477	24,316
	68,477	109,412	177,889	173,353
Deferred revenue:				
Conoco Phillips – Facilities	(5,976)	-	(5,976)	(10,000)
Treadwell Scholarship Fund	(10,710)	-	(10,710)	(13,933)
Gaming - Raffles	(4,175)	-	(4,175)	-
Oil Spill Recovery Institute	-	(591,541)	(591,541)	(590,712)
Community Education	-	(16,446)	(16,446)	(26,829)
POST – Lingcod	-	(15,360)	(15,360)	-
	(20,861)	(623,347)	(644,208)	(641,474)
	$ 47,616	(513,935)	(466,319)	(468,121)

(10) Net Assets – Unrestricted

Unrestricted net assets consist of the following at September 30, 2009 and 2008:

	General and Plant Fund	Program Funds	Totals 2009	Totals 2008
Unrestricted, designated for:				
Operations	$ 28,778	-	28,778	79,359
OSRI reserve	-	1,639,682	1,639,682	1,569,287
Property and equipment	832,548	-	832,548	767,442
Unrestricted net assets	$ 861,326	1,639,682	2,501,008	2,426,088

Net Assets – Unrestricted, continued

Operations

This amount is based on prior year contributions from Memberships, Corporate Sponsors and the Copper River Nouveau for Discretionary and Operating funds.

OSRI Reserve

Investments in the Program Funds are for the Oil Spill Recovery Institute (OSRI). The use of these investment funds are determined by the Oil Spill Recovery Institute Advisory Board at their annual meeting as put before the Board by the Directors. The unrestricted amount of $1,639,682 is interest earned since inception above the capital amount. This reserve has not been used to date but a projection of OSRI Research Program expenditures will begin to use the reserve in fiscal year 2010. With the current economic downtrend, anticipated deposits from the National Oil Spill Liability Trust Fund to the Oil Spill Recovery Institute will be significantly reduced. This will require OSRI to use more of the Reserve for it's Program over the next few years.

SUPPLEMENTARY INFORMATION

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Financial Position - All Program Funds

September 30, 2009

(With Comparative Totals for 2008)

	OSRI Programs	EVOS Programs	Govern-mental Programs	Other Programs	Totals 2009	Totals 2008
Assets						
Current assets:						
Cash and cash equivalents	$ 109,412	-	-	-	109,412	149,037
Receivables:						
Interest receivable	-	-	-	-	-	8,155
Federal grants	-	117,356	111,828	-	229,184	240,282
Other grants	-	-	-	4,800	4,800	122,884
Due from other funds	-	-	-	31,806	31,806	21,189
Total current assets	109,412	117,356	111,828	36,606	375,202	541,547
Investments	2,148,730	-	-	-	2,148,730	2,125,430
Total assets	$ 2,258,142	117,356	111,828	36,606	2,523,932	2,666,977
Liabilities and Net Assets						
Liabilities:						
Deferred revenue	591,541	-	-	31,806	623,347	617,541
Due to other funds	26,919	117,356	111,828	4,800	260,903	480,149
Total liabilities	618,460	117,356	111,828	36,606	884,250	1,097,690
Net assets - unrestricted	1,639,682	-	-	-	1,639,682	1,569,287
Total liabilities and net assets	$ 2,258,142	117,356	111,828	36,606	2,523,932	2,666,977

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities - All Program Funds
Year Ended September 30, 2009
(With Comparative Totals for 2008)

		OSRI Programs	EVOS Programs	Government Programs	Other Programs	Totals 2009	Totals 2008
Revenues:							
Grants and contributions:							
Federal	$	1,050,375	700,809	698,132	18,060	2,467,376	2,180,541
Other		-	-	-	193,070	193,070	980,238
Total grants and contributions		1,050,375	700,809	698,132	211,130	2,660,446	3,160,779
Interest income		3,202	-	-	-	3,202	10,450
Investment income (loss)		67,195	-	-	-	67,195	(47,948)
Total revenues		1,120,772	700,809	698,132	211,130	2,730,843	3,123,281
Expenses:							
Salaries and benefits		380,306	430,083	145,020	73,933	1,029,342	1,106,727
Travel		42,779	6,234	9,793	10,118	68,924	69,551
Professional services		15,219	22,461	11,101	26,385	75,166	52,727
Subcontracts and charter costs		15,248	67,185	330,750	22,874	436,057	593,314
Supplies		17,490	4,283	17,475	9,334	48,582	53,575
Telephone		5,666	5,797	1,629	770	13,862	7,214
Postage and freight		1,578	1,096	707	1,014	4,395	7,035
Printing, publications and copying		6,773	1,382	71	1,082	9,308	5,641
Facilities and rent expense		-	604	32	275	911	1,012
Utilities		8,000	651	-	-	8,651	8,284
Insurance		2,694	-	-	-	2,694	2,788
Equipment rental and maintenance		9,325	1,457	3,829	5,041	19,652	70,972
Advertising		17	57	-	749	823	476
Other		5,563	495	1,202	1,354	8,614	3,746
Grants awarded		338,532	-	-	-	338,532	755,138
Total expenses before interfund facility and equipment costs and indirect costs		849,190	541,785	521,609	152,929	2,065,513	2,738,200
Interfund facility and equipment costs		13,140	5,679	-	1,956	20,775	18,678
Indirect costs		67,708	153,345	84,260	24,791	330,104	288,710
Total expenses		930,038	700,809	605,869	179,676	2,416,392	3,045,588
Change in net assets		190,734	-	92,263	31,454	314,451	77,693
Net assets at beginning of year		1,569,287	-	-	-	1,569,287	1,606,784
Transfers to Plant Fund		(120,339)	-	(92,263)	(31,454)	(244,056)	(115,190)
Net assets at end of year	$	1,639,682	-	-	-	1,639,682	1,569,287

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Combining Schedule of Financial Position - Oil Spill Recovery Institute (OSRI) Programs
September 30, 2009
(With Comparative Totals for 2008)

	OSRI	Science of the Sound / Forest to the Sea	Observational Oceanography	2009 Field Experiment	PWSSC Fellowship	Balloon	Totals 2009	Totals 2008
Assets								
Current assets:								
Cash and cash equivalents	$ 109,412	-	-	-	-	-	109,412	149,037
Receivables - interest receivable	-	-	-	-	-	-	-	8,155
Total current assets	109,412	-	-	-	-	-	109,412	157,192
Investments	2,148,730	-	-	-	-	-	2,148,730	2,125,430
Total assets	$ 2,258,142	-	-	-	-	-	2,258,142	2,282,622
Liabilities and Net Assets								
Liabilities:								
Deferred revenue	591,541	-	-	-	-	-	591,541	590,712
Due to other funds	26,919	-	-	-	-	-	26,919	122,623
Total liabilities	618,460	-	-	-	-	-	618,460	713,335
Net assets - unrestricted	1,639,682	-	-	-	-	-	1,639,682	1,569,287
Total liabilities and net assets	$ 2,258,142	-	-	-	-	-	2,258,142	2,282,622

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities – Oil Spill Recovery Institute (OSRI) Programs
Year Ended September 30, 2009
(With Comparative Totals for 2008)

	OSRI	Science of the Sound / Forest to the Sea	Observational Oceanography	2009 Field Experiment	PWSSC Fellowship	Balloon	Totals 2009	Totals 2008
Revenues:								
Grants and contributions:								
Federal	$ 649,062	67,500	122,821	52,278	75,064	83,650	1,050,375	1,067,647
Other	-	-	-	-	-	-	-	308,779
Total grants and contributions	649,062	67,500	122,821	52,278	75,064	83,650	1,050,375	1,376,426
Interest income	3,202	-	-	-	-	-	3,202	10,450
Investment income (loss)	67,195	-	-	-	-	-	67,195	(47,948)
Total revenues	719,459	67,500	122,821	52,278	75,064	83,650	1,120,772	1,338,928
Expenses:								
Salaries and benefits	243,952	42,898	40,607	15,971	36,878	-	380,306	394,861
Travel	23,023	3,021	4,060	430	11,114	1,131	42,779	34,601
Professional services	7,051	2,435	2,719	2,314	700	-	15,219	20,988
Subcontracts and charter costs	-	560	8,210	-	6,478	-	15,248	16,289
Supplies	3,552	521	9,305	2,159	1,646	307	17,490	18,842
Telephone	3,405	700	1,184	135	242	-	5,666	2,268
Postage and freight	35	80	792	432	132	107	1,578	2,223
Printing, publications and copying	2,141	1,851	2,290	-	491	-	6,773	2,032
Utilities	8,000	-	-	-	-	-	8,000	8,000
Insurance	2,694	-	-	-	-	-	2,694	2,788
Equipment rental and maintenance	-	-	7,180	1,740	-	405	9,325	3,688
Advertising	-	-	-	-	17	-	17	25
Other	1,437	1,320	175	-	2,631	-	5,563	1,601
Grants awarded	338,532	-	-	-	-	-	338,532	755,138
Total expenses before interfund facility and equipment costs and indirect costs	633,822	53,386	76,522	23,181	60,329	1,950	849,190	1,263,344
Interfund facility and equipment costs	13,140	-	-	-	-	-	13,140	13,140
Indirect costs	-	14,114	26,874	11,439	14,735	546	67,708	58,926
Total expenses	646,962	67,500	103,396	34,620	75,064	2,496	930,038	1,335,410
Change in net assets	72,497	-	19,425	17,658	-	81,154	190,734	3,518
Net assets at beginning of year	1,569,287	-	-	-	-	-	1,569,287	1,606,784
Transfers to Plant Fund	(2,102)	-	(19,425)	(17,658)	-	(81,154)	(120,339)	(41,015)
Net assets at end of year	$ 1,639,682	-	-	-	-	-	1,639,682	1,569,287

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
ombining Schedule of Financial Position – Exxon Valdez Oil Spill Trustee Council (EVOS) Progran
September 30, 2009
(With Comparative Totals for 2008)

		Herring Ocean	Herring Thorne	Herring Forage	Seabird Predation	Totals 2009	Totals 2008
Assets							
Current assets - federal grants receivable	$	12,737	36,909	44,117	23,593	117,356	106,853
Liabilities and Net Assets							
Liabilities - due to other funds		12,737	36,909	44,117	23,593	117,356	106,853
Net assets - unrestricted		-	-	-	-	-	-
Total liabilities and net assets	$	12,737	36,909	44,117	23,593	117,356	106,853

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Activities – Exxon Valdez Oil Spill Trustee Council (EVOS) Programs

Year Ended September 30, 2009

(With Comparative Totals for 2008)

	Herring Ocean	Herring Thorne	Herring Forage	Seabird Predation	Totals 2009	Totals 2008
Revenues - grants and contributions - Federal	$ 23,983	220,292	292,398	164,136	700,809	499,612
Expenses:						
Salaries and benefits	17,303	108,405	184,847	119,528	430,083	238,291
Travel	945	3,506	211	1,572	6,234	5,248
Professional services	-	-	22,461	-	22,461	11,695
Subcontracts and charter costs	-	56,106	9,231	1,848	67,185	112,011
Supplies	-	77	2,302	1,904	4,283	17,979
Telephone	150	1,492	2,188	1,967	5,797	2,150
Postage and freight	330	491	161	114	1,096	672
Printing, publications and copying	7	1	885	489	1,382	202
Facilities and rent expense	-	-	-	604	604	559
Utilities	-	651	-	-	651	284
Equipment rental and maintenance	-	1,336	121	-	1,457	4,050
Advertising	-	25	32	-	57	62
Other	-	-	300	195	495	439
Total expenses before interfund facility and equipment costs and indirect costs	18,735	172,090	222,739	128,221	541,785	393,642
Interfund facility and equipment costs	-	-	5,679	-	5,679	1,845
Indirect costs	5,248	48,202	63,980	35,915	153,345	98,072
Total expenses	23,983	220,292	292,398	164,136	700,809	493,559
Change in net assets	-	-	-	-	-	6,053
Net assets at beginning of year	-	-	-	-	-	-
Transfers to Plant Fund	-	-	-	-	-	(6,053)
Net assets at end of year	$ -	-	-	-	-	-

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Financial Position – Other Programs

Government Grants

September 30, 2009

(With Comparative Totals for 2008)

		Alaska OOS	Comm Ed EPA Clean Oceans	Comm Ed NFWF	Comm Ed NPRB	NPRB Bishop	NMFS PWS Sea Lions	NPS Long Lake Weir	Misc. Grants	Totals 2009	Totals 2008
Assets											
Current assets - federal grants receivable	$	102,873	-	749	2,074	-	-	2,931	3,201	111,828	193,080
Liabilities and Net Assets											
Liabilities - due to other funds		102,873	-	749	2,074	-	-	2,931	3,201	111,828	193,080
Net assets - unrestricted		-	-	-	-	-	-	-	-	-	-
Total liabilities and net assets	$	102,873	-	749	2,074	-	-	2,931	3,201	111,828	193,080

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Activities – Other Programs

Government Grants

Year Ended September 30, 2009

(With Comparative Totals for 2008)

	Alaska OOS	Comm Ed EPA Clean Oceans	Comm Ed NFWF	Comm Ed NPRB	NPRB Bishop	NMFS PWS Sea Lions	NPS Long Lake Weir	Misc. Grants	Totals 2009	Totals 2008
Revenues - federal grants and contributions	$ 536,396	15,000	22,629	2,074	15,403	90,896	12,532	3,202	698,132	984,948
Expenses:										
Salaries and benefits	57,440	9,158	10,085	1,609	7,560	59,168	-	-	145,020	335,547
Travel	5,885	-	1,505	-	174	2,229	-	-	9,793	22,712
Professional services	7,043	-	4,058	-	-	-	-	-	11,101	9,729
Subcontracts and charter costs	305,148	-	1,620	-	2,945	11,037	10,000	-	330,750	419,473
Supplies	9,774	2,264	2,379	-	1,327	62	-	1,669	17,475	6,762
Telephone	639	458	107	11	27	387	-	-	1,629	1,087
Postage and freight	552	-	48	-	-	107	-	-	707	1,227
Printing, publications and copying	65	6	-	-	-	-	-	-	71	2,520
Utilities	-	-	-	-	-	32	-	-	32	453
Equipment rental and maintenance	3,684	145	-	-	-	-	-	-	3,829	52,257
Other	1,182	-	20	-	-	-	-	-	1,202	1,390
Total expenses before interfund facility and equipment costs and indirect costs	391,412	12,031	19,822	1,620	12,033	73,022	10,000	1,669	521,609	853,157
Interfund facility and equipment costs	-	-	-	-	-	-	-	-	-	600
Indirect costs	56,383	2,969	-	454	3,370	17,874	2,532	678	84,260	116,076
Total expenses	447,795	15,000	19,822	2,074	15,403	90,896	12,532	2,347	605,869	969,833
Change in net assets	88,601	-	2,807	-	-	-	-	855	92,263	15,115
Net assets at beginning of year	-	-	-	-	-	-	-	-	-	-
Transfers to Plant Fund	(88,601)	-	(2,807)	-	-	-	-	(855)	(92,263)	(15,115)
Net assets at end of year	$ -	-	-	-	-	-	-	-	-	-

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Financial Position – Other Programs

Non-Government Grants

September 29, 2009

(With Comparative Totals for 2008)

		Community Education / Science Camp	Murdock Zoo-plankton	NOAA Whittier Reef	ADF&G Invasive Species	POST Lingcod	Misc. Grants	Totals 2009	Totals 2008
Assets									
Current assets:									
Receivables:									
Federal grants	$	-	-	-	-	-	-	-	5,500
Other grants		-	-	-	-	-	4,800	4,800	57,733
Due from other funds		16,446	-	-	-	15,360	-	31,806	21,189
Total assets	$	16,446	-	-	-	15,360	4,800	36,606	84,422
Liabilities and Net Assets									
Liabilities:									
Deferred revenue		16,446	-	-	-	15,360	-	31,806	26,829
Due to other funds		-	-	-	-	-	4,800	4,800	57,593
Total liabilities		16,446	-	-	-	15,360	4,800	36,606	84,422
Net assets - unrestricted		-	-	-	-	-	-	-	-
Total liabilities and net assets	$	16,446	-	-	-	15,360	4,800	36,606	84,422

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities - Other Programs
Non-Government Grants
Year Ended September 30, 2009
(With Comparative Totals for 2008)

	Community Education / Science Camp	Murdock Zoo-plankton	NOAA Whittier Reef	ADF&G Invasive Species	POST Lingcod	Misc. Grants	Totals 2009	Totals 2008
Revenues - grants and contributions:								
Federal	$ -	-	2,555	7,205	-	8,300	18,060	14,339
Other	94,710	25,920	-	-	64,940	7,500	193,070	285,454
Total revenues	94,710	25,920	2,555	7,205	64,940	15,800	211,130	299,793
Expenses:								
Salaries and benefits	62,759	-	2,014	4,112	3,138	1,910	73,933	138,028
Travel	5,526	-	-	-	245	4,347	10,118	6,990
Professional services	1,999	23,511	-	-	875	-	26,385	10,315
Subcontracts and charter costs	534	-	-	1,653	12,227	8,460	22,874	45,541
Supplies	5,462	-	-	-	3,839	33	9,334	9,992
Telephone	140	453	-	13	164	-	770	1,709
Postage and freight	313	-	-	-	701	-	1,014	2,913
Printing, publications and copying	1,045	-	-	-	37	-	1,082	887
Facilities and rent expense	275	-	-	-	-	-	275	-
Equipment rental and maintenance	2,028	-	-	-	3,013	-	5,041	10,977
Advertising	749	-	-	-	-	-	749	389
Other	1,354	-	-	-	-	-	1,354	316
Total expenses before interfund facility and equipment costs and indirect costs	- 82,184	23,964	2,014	5,778	24,239	14,750	152,929	228,057
Interfund facility and equipment costs	-	1,956	-		-	-	1,956	3,093
Indirect costs	12,526	-	541	1,427	9,247	1,050	24,791	15,636
Total expenses	94,710	25,920	2,555	7,205	33,486	15,800	179,676	246,786
Change in net assets	-	-	-	-	31,454	-	31,454	53,007
Net assets at beginning of year	-	-	-	-	-	-	-	-
Transfers to Plant Fund	-	-	-	-	(31,454)	-	(31,454)	(53,007)
Net assets at end of year	$ -	-	-	-	-	-	-	-

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Financial Statements and Supplementary Information

Year Ended September 30, 2008

(With Independent Auditor's Report Thereon)

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Table of Contents

Mikunda,
Cottrell & Co., Inc.
Certified Public Accountants & Consultants

RSM McGladrey Network
An Independently Owned Member

Offices in Anchorage & Kenai

Independent Auditor's Report

The Board of Directors
Prince William Sound Science and Technology Institute
(d.b.a. Prince William Sound Science Center)
Cordova, Alaska

We have audited the accompanying statement of financial position of Prince William Sound Science and Technology Institute (d.b.a. Prince William Sound Science Center) as of September 30, 2008, and the related statements of activities and cash flows for the year then ended. These financial statements are the responsibility of the Prince William Sound Science Center's management. Our responsibility is to express an opinion on these financial statements based on our audit. The prior year summarized comparative information has been derived from the Prince William Sound Science Center's 2007 financial statements, and in our report dated January 11, 2008, we expressed an unqualified opinion on those financial statements.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards,* issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and the significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of Prince William Sound Science Center as of September 30, 2008, and the changes in its net assets and its cash flows for the year then ended in conformity with accounting principles generally accepted in the United States of America.

In accordance with *Government Auditing Standards,* we have also issued our report dated February 13, 2009 on our consideration of Prince William Sound Science Center's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on the internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* and should be considered in assessing the results of our audit.

3601 "C" Street, Suite 600 • Anchorage, Alaska 99503 • (907) 278-8878 • Fax (907) 278-5779 • www.mcc-cpa.com

The Board of Directors
Prince William Sound Science and Technology Institute
(d.b.a. Prince William Sound Science Center)

Our audit was conducted for the purpose of forming an opinion on the basic financial statements taken as a whole. The supplementary information included in Schedules 1 through 10 is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the audit of the basic financial statements and, in our opinion, is fairly stated, in all material respects, in relation to the basic financial statements taken as a whole.

Mikunda, Cottrell & Co.

Anchorage, Alaska
February 13, 2009

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Statement of Financial Position

September 30, 2008

(With Comparative Totals for 2007)

	General Fund	Plant Fund	Program Funds	Totals 2008	Totals 2007
Assets					
Current assets:					
Cash and cash equivalents	$ 24,316	-	149,037	173,353	52,071
Receivables:					
Trade	7,892	-	-	7,892	6,427
Interest	-	-	8,155	8,155	7,886
Federal grants	-	-	305,433	305,433	307,349
Other grants	-	-	57,733	57,733	-
Prepaids and other assets	58,635	-	-	58,635	56,107
Due from other funds	480,149	-	21,189	501,338	436,957
Leasehold, current portion	18,000	-	-	18,000	18,000
Total current assets	588,992	-	541,547	1,130,539	884,797
Investments	-	-	2,125,430	2,125,430	2,247,471
Leasehold, long-term portion	19,500	-	-	19,500	37,500
Property and equipment, net of accumulated depreciation	-	767,442	-	767,442	801,371
Total assets	$ 608,492	767,442	2,666,977	4,042,911	3,971,139
Liabilities and Net Assets					
Current liabilities:					
Accounts payable	317,276	-	-	317,276	230,952
Wages, taxes and benefits payable	119,235	-	-	119,235	119,467
Deferred revenue	23,933	-	617,541	641,474	589,980
Due to other funds	21,189	-	480,149	501,338	436,957
Total current liabilities	481,633	-	1,097,690	1,579,323	1,377,356
Net assets:					
Temporarily restricted	37,500	-	-	37,500	55,500
Unrestricted	89,359	767,442	1,569,287	2,426,088	2,538,283
Total net assets	126,859	767,442	1,569,287	2,463,588	2,593,783
Total liabilities and net assets	$ 608,492	767,442	2,666,977	4,042,911	3,971,139

See accompanying notes to financial statements.

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Statement of Activities

Year Ended September 30, 2008

(With Comparative Totals for 2007)

	General Fund	Plant Fund	Program Funds	Totals 2008	Totals 2007
Revenues:					
Grants, contracts, and contributions:					
Federal	$ -	-	2,875,325	2,875,325	2,381,102
Other	74,489	-	285,454	359,943	302,121
Total grants, contracts, and contributions	74,489	-	3,160,779	3,235,268	2,683,223
Interest	263	-	10,450	10,713	3,641
Investment income (loss)	-	-	(47,948)	(47,948)	187,844
Total revenues	74,752	-	3,123,281	3,198,033	2,874,708
Net assets released from restrictions due to passage of time	18,000	-	-	18,000	18,000
Total unrestricted revenues	92,752	-	3,123,281	3,216,033	2,892,708
Expenses:					
Salaries and benefits	244,411	-	1,106,727	1,351,138	1,254,116
Travel	32,243	-	69,551	101,794	111,220
Professional services	23,434	-	52,727	76,161	106,966
Subcontracts and charter costs	-	-	593,314	593,314	393,701
Supplies	9,337	-	53,575	62,912	70,822
Telephone	2,952	-	7,214	10,166	19,232
Postage and freight	2,956	-	7,035	9,991	9,039
Printing, publications and copying	19,446	-	5,641	25,087	21,359
Facilities and rent expense	39,338	-	1,012	40,350	37,443
Utilities	22,060	-	8,284	30,344	25,078
Insurance	28,133	-	2,788	30,921	30,005
Equipment rental and maintenance	602	-	70,972	71,574	67,199
Advertising	1,690	-	476	2,166	3,964
Other	12,083	-	3,746	15,829	19,680
Grants awarded	-	-	755,138	755,138	467,978
Amortization and depreciation	-	151,343	-	151,343	237,276
Total expenses before interfund facility and equipment costs and indirect costs (reimbursement)	438,685	151,343	2,738,200	3,328,228	2,875,078
Interfund facility and equipment costs (reimbursement)	(18,678)	-	18,678	-	-
Indirect costs (reimbursement)	(288,710)	-	288,710	-	-
Total expenses	131,297	151,343	3,045,588	3,328,228	2,875,078
Increase (decrease) in unrestricted net assets	(38,545)	(151,343)	77,693	(112,195)	17,360
Decrease in temporarily restricted net assets - net assets released from restriction	(18,000)	-	-	(18,000)	(18,000)
Change in net assets	(56,545)	(151,343)	77,693	(130,195)	(370)
Net assets at beginning of year	185,628	801,371	1,606,784	2,593,783	2,594,153
Transfers from General Fund and Program Funds	-	117,414	-	117,414	98,854
Transfers to Plant Fund	(2,224)	-	(115,190)	(117,414)	(98,854)
Net assets at end of year	$ 126,859	767,442	1,569,287	2,463,588	2,593,783

See accompanying notes to financial statements.

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Statement of Cash Flows

Year Ended September 30, 2008

(With Comparative Totals for 2007)

		General Fund	Plant Fund	Program Funds	Totals 2008	Totals 2007
Cash flows from operating activities:						
Change in net assets	$	(56,545)	(151,343)	77,693	(130,195)	(370)
Adjustments to reconcile change in net assets to net cash provided (used) by operating activities:						
Amortization and depreciation		-	151,343	-	151,343	237,276
(Gains) losses on investments		-	-	106,660	106,660	(144,561)
(Increase) decrease in assets:						
Trade receivable		(1,465)	-	-	(1,465)	(2,613)
Grants, contracts, and contributions receivable		-	-	(55,817)	(55,817)	89,638
Prepaids and other assets		(2,528)	-	-	(2,528)	(14,951)
Due from other funds		(47,738)	-	(16,643)	(64,381)	107,318
Interest receivable		-	-	(269)	(269)	(210)
Leasehold		18,000	-	-	18,000	18,000
Increase (decrease) in liabilities:						
Accounts payable		86,324	-	-	86,324	(41,441)
Wages, taxes and benefits payable		(232)	-	-	(232)	(10,377)
Deferred revenue		1,568	-	49,926	51,494	(206,851)
Due to other funds		16,643	-	47,738	64,381	(107,318)
Net cash provided (used) by operating activities		14,027	-	209,288	223,315	(76,460)
Cash flows from investing activities:						
Purchase of investments			-	(760,057)	(760,057)	(740,820)
Proceeds from maturities of investments		-	-	775,438	775,438	863,488
Additions to property and equipment		(2,224)	-	(115,190)	(117,414)	(98,854)
Net cash provided (used) by investing activities		(2,224)	-	(99,809)	(102,033)	23,814
Net increase (decrease) in cash		11,803	-	109,479	121,282	(52,646)
Cash at beginning of year		12,513	-	39,558	52,071	104,717
Cash at end of year	$	24,316	-	149,037	173,353	52,071

See accompanying notes to financial statements.

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Notes to Financial Statements

September 30, 2008

(1) Organization and Summary of Significant Accounting Policies

Organization

Prince William Sound Science and Technology Institute (d.b.a. Prince William Sound Science Center) (Center) was formed in 1989 as an Alaska not-for-profit scientific research and education corporation to contribute to the comprehensive description, sustained monitoring and ecological understanding of Prince William Sound, the Copper River, and Gulf of Alaska. Establishment of the Center followed the Exxon Valdez oil spill although planning of this institution preceded that event. The underlying philosophy of the Center is to serve as a model for long-term ecosystem management. Operations are financed principally by public contributions and grants from industry and various governmental agencies.

Basis of Accounting

The financial statements of the Center have been prepared on the accrual basis of accounting and in accordance with policies consistent with those prescribed by the Audit and Accounting Guide for Not-for-Profit Organizations, issued by the American Institute of Certified Public Accountants. In order to ensure observation of limitations and restrictions placed on the use of resources available to the Center, the accounts are maintained in accordance with the principles of fund accounting. This is the procedure by which resources for various purposes are classified for accounting and reporting purposes into funds established according to their nature and purpose. As a result, the Center has adopted the following funds:

General – Accounts for the supporting services of the Center and all transactions not accounted for in the program funds or plant fund.

Plant – Accounts for the ownership of property and equipment and any associated debt.

Program – Accounts for expendable funds restricted by the donor, grantor or other outside party for a specific purpose or program.

Net assets and revenues, expenses, gains and losses are classified based on the existence or absence of donor-imposed restrictions. Accordingly, net assets of the Center and changes therein are reported as follows:

Unrestricted Net Assets – Net assets that are not subject to donor-imposed stipulations.

Organization and Summary of Significant Accounting Policies, continued

Basis of Accounting, continued

Temporarily Restricted Net Assets – Temporarily restricted resources are restricted by the donor, grantor or other outside parties whose restrictions either expire by the passage of time or can be fulfilled and removed by actions of the Center. Revenues associated with these resources are earned when the Center undertakes the necessary action or other restrictions are met. When a donor restriction expires, that is, when a stipulated time restriction ends or a purpose restriction is accomplished, temporarily restricted net assets are reclassified to unrestricted net assets and reported in the statement of activities as net assets released from restriction. Revenues associated with restricted contributions received during the reporting period which are met during the reporting period are recorded as unrestricted revenues.

Management Estimates

In preparing the financial statements, management is required to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the statement of financial position, and revenues and expenses for the period. Actual results could differ from those estimates and assumptions.

Support and Revenues

Operating moneys restricted by the grantor are deemed to be earned and reported as revenues when the Center has incurred costs in compliance with the specific restrictions. Such amounts received but not earned are reported as deferred revenue.

Indirect Costs

Indirect costs include overhead allocations for space, equipment, salaries, utilities, and certain other costs paid for by the General Fund and allocable to the program funds.

Investments

The Center records investments at fair value.

Property and Equipment

Field and office equipment and furnishings are recorded at cost or, in the case of donated property, at the estimated fair value on the date of receipt. Depreciation is calculated on a straight-line basis over the estimated useful lives of the assets. Leasehold improvements are carried at cost and are amortized on a straight-line basis over the life of the lease or life of the improvement, whichever is less. Property and equipment financed by certain grantors in the program funds remain the property of the grantor and as such are recorded as expenditures in the program funds. Expenditures for repairs and maintenance are charged to operations, as incurred.

Organization and Summary of Significant Accounting Policies, continued

Income Tax Status

The Center qualifies as a not-for-profit corporation under Section 501(c)(3) of the Internal Revenue Code and therefore, is not subject to federal or state income tax on its qualifying exempt activities.

(2) **Program Classifications**

Program funds consist of the following:

Oil Spill Recovery Institute (OSRI)

This program funds the administration and awards of the Oil Spill Recovery Institute, a federally established program to improve technologies for prevention and response to oil pollution issues in the Arctic and Subarctic; and, also to investigate the environmental and socio-economic impact of oil spills in the Arctic and Subarctic marine environments. Beginning in 1997, funding is provided directly from the interest earnings on a $22.4 million fund administered by the U.S. Coast Guard (through the National Oil Spill Liability Trust Fund). The Institute is governed by an Advisory Board which includes representatives from Federal and State agencies, Alaska Native and PWS community, and industry representatives appointed by the Governor of Alaska. The Advisory Board Chair is a U.S. Department of Commerce representative.

OSRI - Community Education Programs – Science of the Sound / Forest to the Sea

The Science of the Sound program has three major components: (1) the Discovery Room, a program which supplements elementary school science education in the community; (2) Summer Science Camp, "From the Forest to the Sea", offering residential camp sessions to ages 7-15 and families; and (3) Regional Outreach, a program that delivers science and environmental education to the remote communities of Prince William Sound. Funding for these programs come from OSRI, corporate and foundation donations, camp revenues, and a partnership program with the U.S. Forest Service, which provides in-kind donations of salaries and supplies.

Observational Oceanography

OSRI funds an observational oceanography program for multiple purposes. The primary sub-program of three is to provide an improved description of the flow through the straits connecting Prince William Sound (PWS) with the Gulf of Alaska (GOA). This objective is a necessary step towards a better understanding of the relationship between circulation variability and biological variability in PWS. A second sub-program aims to acquire a description of the seasonal evolution of the hydrographic properties and circulation in the central basin of PWS. A third observational program aims at acquiring a better knowledge on the spatial and temporal variability of the effects of freshwater runoff in the near shore area of PWS.

Program Classifications, continued

PWSSC Fellowships

OSRI funds two fellowships for PWSSC Biological Researchers. 1) to complete papers for the results of the OSRI/EVOS Copper River Delta Study and 2) Analysis and papers on the "variability in Prince William Sound using stable isotopes."

Herring Planning

This EVOS Trustee Council funded project is for selected Science Center staff to participate as members of a multi-disciplined steering group, with direct public involvement, to develop a strategy, define goals and courses of actions for Prince William Sound herring enhancements. This information will be used to create a program of intervention designed to restore herring to levels suitable for commercial and subsistence uses.

Trophic Dynamics

This is an EVOS Trustee Council funded study of the benthic invertebrates inhabiting the sediments and Intertidal flats of the Copper River Delta and southeastern PWS. This is a large scale field study that examines the physical/chemical and biological influences on invertebrate community dynamics. When complete, this project will be synthesized with the OSRI Intertidal predator study to develop long term monitoring parameters.

Herring Ocean

This is an EVOS Trustee Council funded study to address the "physical oceanographic factors affecting productivity in juvenile Pacific Herring nursery habitats" in Prince William Sound. This study will build upon past research and also provide a physical context for a suite of proposed biological sampling. This is year two of a 3 year study by the EVOSTC.

Herring Thorne

This is an EVOS Trustee Council funded project to conduct surveys on abundance, distribution and condition of key herring life stages in Prince William Sound as a basis for restoration. This study allows for additional field work to monitor barometers of the PWS herring populations. This will add another dimension to the herring overwintering work currently being done at PWSSC. This is year two of a 3 year study by the EVOSTC.

Herring Forage

This is an EVOS Trustee Council funded project to study herring recruitment contingent on young herring attaining from zooplankton sufficient energy content to survive the first winter. Juvenile herring will be sampled and natural stable isotope abundance for comparison with prior SEA data. This is year two of a 3 year study by the EVOSTC.

Program Classifications, continued

Seabird Predation

This is an EVOS Trustee Council funded study awarded to the U.S. Fish & Wildlife Service and the PWSSC for Seabird Predation on Juvenile Herring in Prince William Sound during the winter months. This is year one of a potential 3 year study that when completed will aid in planning future restoration efforts from the Exxon Valdez Oil Spill as well as help assess the role of seabird predation on herring recruitment.

AOOS - Alaska Ocean Observing System

This project, funded by NOAA via the Alaska Ocean Observing System will include the purchase and installation of SNOTEL gauges for Meteorological and Precipitation Data, additional equipment for oceanographic moorings in PWS, and for installation of telemetry equipment for the Copper River Stream gauge. PWSSC will also conduct Thermosalinograph surveys and Mooring enhancements to measure biophysical coupling at Hinchinbrook Entrance and Montague Straits.

PWSOOS - PWS Ocean Observing System

This project, funded through NOAA via a Congressional appropriation will integrate ongoing research and monitoring to document, simulate and predict atmospheric and oceanographic conditions in PWS and the adjacent Copper River Delta, and will provide user-friendly data access (see www.pwsoos.org). It is the pilot project for the Alaska Ocean Observing System, which is part of a national program called the Integrated Ocean Observing Systems (IOOS). It will achieve progress towards goals outlined in the Oil Pollution Act of 1990 to develop the most effective oil spill prevention and response strategies for PWS and continued monitoring and assessment of resources at risk in PWS.

NPRB / AOOS – Schoch

This project was funded jointly by NPRB and AOOS to provide funds for continued development of an integrated ecosystem research program for the Gulf of Alaska and the PWS Ocean Observing system as a pilot program for the Alaska Ocean Observing System.

NPRB Bishop – Residency and Movements of Copper Rockfish

Funded by the NPRB and OSRI the goal of this pilot project is to prove the efficacy of acoustic telemetry for documenting residency and movements of copper rockfish and lingcod in the near shore areas of Prince William Sound. Their use of near shore waters makes them vulnerable to oil spill events.

Program Classifications, continued

National Marine Fisheries Service (NMFS) PWS Sea Lion

This project, funded through National Marine Fisheries Service (NMFS) via a Congressional appropriation investigates the role of Pacific herring as important winter-period forage for Stellar Sea Lions. PWSSC has monitored the abundance of herring in PWS since 1993. Annual winter surveys of Herring conducted in PWS show that the numbers of foraging Stellar Sea Lions highly correlate to herring biomass. This project takes place in Prince William Sound and the Kodiak Archipelago.

NPS Long Lake Weir

The NPS is charged with monitoring natural resources that provide management with an indicator of the health of the ecosystem. The fish weir at Long Lake, Alaska, provides an opportunity to monitor an important salmon run in the Chitina River. This project is funded by NPS to the Center to assist the NPS with the management and operation of this fish weir to provide continuous historical salmon information.

Murdock Zooplankton

Funded by the M.J. Murdock Charitable Trust, this project supports PWSSC's work in collecting new, critical data on Zooplankton in PWS using a sophisticated Hydro-bios Multi-net system. Funding supports equipment purchase and salary for a post-doctoral technician to operate the new equipment.

Rasmuson - Bishop

Support by the Rasmuson Foundation for Radio Telemetry equipment that will upgrade and expand the PWSSC research capabilities. This project is designed to assess residency and movements by lingcod and by four species of Sebastes rockfish in the near shore waters of Prince William Sound using acoustic telemetry. This project will also examine the efficacy of moored hydrophone systems for tracking movement of commercially important fishes. This project will work cooperatively with the POST – Lingcod project.

NOAA Whittier Reef

This project is funded by the NOAA to monitor the installation of a series of artificial reefs in the vicinity of Whittier, Alaska. PWSSC, in cooperation with the University of South Alabama, Dauphin Island Sea Lab will document the marine community at the artificial reef and will determine if artificial reef communities enhance the immediate marine environment.

GIS Ecotrust

This project is funded by Ecotrust to assist the Center in developing a comprehensive GIS program that will, in conjunction with others provide a Copper River Knowledge System to manage resources and increase the capacity to distribute knowledge on the bioregion.

Program Classifications, continued

ADF&G Beluga Whale / Invasive Species

ADF&G provides some funds for PWSSC Logistic and Technical assistance to monitor Beluga Whales in Cook Inlet. ADF&G provides some funds for PWSSC to develop a cooperative program to monitor invasive species on the Copper River Delta. The program will collect scientific and local knowledge of invasive species in and around surveys on the western Copper River Delta and Orca Inlet.

Response Planning Group (RPG) Data

This project is funded by the Alaska Tanker Company on behalf of the Response Planning Group (RPG) and is to develop a "Work Plan for Development of Environmental Data for Prince William Sound". PWSSC and OSRI will assemble and analyze or subcontract for analysis environmental data for PWS that can be used by the oil shippers to identify environmental and operational conditions that would limit the effectiveness of a chosen response tactic in the event of an oil spill.

POST – Lingcod

This project is funded by the Pacific Ocean Shelf Tracking (POST) Project. This is for work titled "Tracking Movements of Lingcod *Ophiodon elongates* in Prince William Sound using Acoustic Tags and Arrays: Expanding Local Infrastructure and Capacity." Acoustic tags are placed on lingcod in Prince William Sound. With the help of the Ocean Tracking Network (OTN), the tagged fish will then be monitored from acoustic arrays installed at the entrances to and selected bays in Prince William Sound and to detect lingcod movement in and out, and around the Sound. This project will use radio telemetry equipment upgrades funded by the Rasmuson Foundation.

Functional Expenses

The Center has four functional project areas that incurred expenses: OSRI, EVOS, Government and Other Projects. Each functional area had the following expenses for each of the years ending September 30:

	2008	2007
OSRI	$ 1,335,410	1,010,642
EVOS	493,559	496,908
Government	950,522	789,976
Other	266,097	258,678
	$ 3,045,588	2,556,204

(3) **Cash**

Financial instruments that potentially subject the Center to concentrations of credit risk consist principally of cash deposits. Accounts are insured by the Federal Deposit Insurance Corporation (FDIC) up to $100,000. At September 30, 2008 and 2007, the Center had approximately $81,814 and $0 respectively, in excess of FDIC insured limits.

(4) **Investments**

Investments held by the Center for the Oil Spill Recovery Institute program are held at fair values and consist of the following at September 30, 2008 and 2007:

	2008		2007	
	Cost	Fair Value (Market)	Cost	Fair Value (Market)
U.S. Treasury bills	$ 497,400	497,132	538,877	548,272
Corporate bonds	318,098	293,662	291,998	291,175
Certificates of deposit	1,464,359	1,334,636	1,404,605	1,408,024
	$ 2,279,857	2,125,430	2,235,480	2,247,471

Investments in equity securities are held through an investment broker. The broker is a member of the Securities Investor Protection Corporation (SIPC) established by Congress in 1970. If the broker-dealer fails, SIPC funds are available to make up any shortfall in client assets that the broker-dealer was required to maintain up to a maximum of $500,000 for securities, and inclusive of up to $100,000 of cash.

The Center's total investment balance which includes equity securities, debt securities, and cash and money market funds, which are included in cash and cash equivalents, and investments on the statement of financial position, was $2,159,934 and $2,282,882 at September 30, 2008 and 2007, respectively.

Investment income consisted of the following for the years ended September 30, 2008 and 2007:

	2008	2007
Interest and dividends	$ 64,148	47,832
Investment fees	(5,436)	(4,549)
Unrealized gain (loss)	(166,417)	144,561
Realized gain (loss)	59,757	-
	$ (47,948)	187,844

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Notes to Financial Statements, continued

(5) Property and Equipment

Property and equipment consist of the following at September 30, 2008 and 2007:

	2008	2007
Property and equipment:		
Field equipment	$ 1,249,732	1,163,499
Office equipment	207,156	189,743
Furnishings	45,126	45,126
Leasehold improvements	538,966	538,966
	2,040,980	1,937,334
Accumulated depreciation	(1,273,538)	(1,135,963)
Property and equipment, net of accumulated depreciation	$ 767,442	801,371

(6) Temporarily Restricted – Operating Lease

The Center entered into a 10-year operating lease commencing November 2, 2000 with the City of Cordova for the building and dock that it occupies. The annual lease payment is $1. The estimated fair value of the remaining lease term is recorded as a temporarily restricted asset on the statement of financial position. The annual lease benefit is recorded as net assets released from restriction and facilities and equipment rent on the statement of activities. At September 30, 2008 and 2007, the future lease benefit was estimated at $37,500 and $55,500, respectively. The lease benefit was estimated at $18,000 for both fiscal years 2008 and 2007.

(7) Annuity Program

The Center has a qualified 403(b) plan. The plan, which is voluntary, allows employees to contribute up to 20% of their base salary, subject to Internal Revenue Service limitations, and requires the employer to match contributions up to 6% of a participant's base compensation. Employees are 100% vested in employer contributions after three years of service. Employer contributions were $35,167 and $36,534 for the years ended September 30, 2008 and 2007 respectively. The program's custodian is Nationwide Life Insurance Company.

(8) **Concentrations of Risk and Contingency**

The Center receives the majority of its funding through the Oil Spill Recovery Institute, the Exxon Valdez Oil Spill (EVOS) Trustee Council along with other state and federal government agencies. Changes in those agencies could have a detrimental effect on the Center's financial position.

Expenditures made pursuant to grants and contracts are subject to audit by governmental agencies or their representatives. Management of the Center believes that no significant liabilities will result from any such audits and, accordingly, no provision for liability is included in the accompanying financial statements.

(This page left blank intentionally)

SUPPLEMENTARY INFORMATION

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Financial Position - All Program Funds

September 30, 2008

(With Comparative Totals for 2007)

				Other Govern-ment		Totals	
		OSRI Programs	EVOS Programs	Programs	Other Programs	2008	2007
Assets							
Current assets:							
Cash and cash equivalents	$	149,037	-	-	-	149,037	39,558
Receivables:							
Interest		8,155	-	-	-	8,155	7,886
Federal grants, contracts, and contributions		-	106,853	193,080	5,500	305,433	280,115
Other grants, contracts, and contributions		-	-	-	57,733	57,733	27,234
Due from other funds		-	-	-	21,189	21,189	4,546
Total current assets		157,192	106,853	193,080	84,422	541,547	359,339
Investments		2,125,430	-	-	-	2,125,430	2,247,471
Total assets	$	2,282,622	106,853	193,080	84,422	2,666,977	2,606,810
Liabilities and Net Assets							
Current liabilities:							
Deferred revenue		590,712	-	-	26,829	617,541	567,615
Due to other funds		122,623	106,853	193,080	57,593	480,149	432,411
Total current liabilities		713,335	106,853	193,080	84,422	1,097,690	1,000,026
Net assets - unrestricted		1,569,287	-	-	-	1,569,287	1,606,784
Total liabilities and net assets	$	2,282,622	106,853	193,080	84,422	2,666,977	2,606,810

Schedule 2

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities - All Program Funds
Year Ended September 30, 2008
(With Comparative Totals for 2007)

	OSRI Programs	EVOS Programs	Other Government Programs	Other Programs	Totals 2008	Totals 2007
Revenues:						
Grants, contracts, and contributions:						
Federal	$ 1,376,426	499,612	984,948	14,339	2,875,325	2,381,102
Other	-	-	-	285,454	285,454	253,475
Total grants, contracts, and contributions	1,376,426	499,612	984,948	299,793	3,160,779	2,634,577
Interest income	10,450	-	-	-	10,450	3,260
Investment income (loss)	(47,948)	-	-	-	(47,948)	187,844
Total revenues	1,338,928	499,612	984,948	299,793	3,123,281	2,825,681
Expenses:						
Salaries and benefits	394,861	238,291	335,547	138,028	1,106,727	1,060,892
Travel	34,601	5,248	22,712	6,990	69,551	80,543
Professional services	20,988	11,695	9,729	10,315	52,727	63,347
Subcontracts and charter costs	16,289	112,011	419,473	45,541	593,314	393,521
Supplies	18,842	17,979	6,762	9,992	53,575	61,336
Telephone	2,268	2,150	1,087	1,709	7,214	16,347
Postage and freight	2,223	672	1,227	2,913	7,035	5,982
Printing, publications and copying	2,032	202	2,520	887	5,641	4,429
Facilities and rent expense	-	559	453	-	1,012	6,712
Utilities	8,000	284	-	-	8,284	951
Insurance	2,788	-	-	-	2,788	2,787
Equipment rental and maintenance	3,688	4,050	52,257	10,977	70,972	60,646
Advertising	25	62	-	389	476	2,438
Other	1,601	439	1,390	316	3,746	6,772
Grants awarded	755,138	-	-	-	755,138	467,978
Total expenses before interfund facility and equipment costs and indirect costs	1,263,344	393,642	853,157	228,057	2,738,200	2,234,681
Interfund facility and equipment costs	13,140	1,845	600	3,093	18,678	14,589
Indirect costs	58,926	98,072	116,076	15,636	288,710	306,934
Total expenses	1,335,410	493,559	969,833	246,786	3,045,588	2,556,204
Change in net assets	3,518	6,053	15,115	53,007	77,693	269,477
Net assets at beginning of year	1,606,784	-	-	-	1,606,784	1,415,678
Transfers to Plant Fund	(41,015)	(6,053)	(15,115)	(53,007)	(115,190)	(78,371)
Net assets at end of year	$ 1,569,287	-	-	-	1,569,287	1,606,784

Schedule 3

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Financial Position - Oil Spill Recovery Institute (OSRI) Programs

September 30, 2008

(With Comparative Totals for 2007)

	OSRI	Science of the Sound / Forest to the Sea	Observ-ational Ocean-ography	PWSSC Fellowship	Totals 2008	Totals 2007
Assets						
Current assets:						
Cash and cash equivalents	$ 149,037	-	-	-	149,037	39,558
Receivables - interest	8,155	-	-	-	8,155	7,886
Total current assets	157,192	-	-	-	157,192	47,444
Investments	2,125,430	-	-	-	2,125,430	2,247,471
Total assets	$ 2,282,622	-	-	-	2,282,622	2,294,915
Liabilities and Net Assets						
Current liabilities:						
Deferred revenue	590,712	-	-	-	590,712	563,069
Due to other funds	122,623	-	-	-	122,623	125,062
Total current liabilities	713,335	-	-	-	713,335	688,131
Net assets - unrestricted	1,569,287	-	-	-	1,569,287	1,606,784
Total liabilities and net assets	$ 2,282,622	-	-	-	2,282,622	2,294,915

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Activities – Oil Spill Recovery Institute (OSRI) Programs

Year Ended September 30, 2008

(With Comparative Totals for 2007)

	OSRI	Science of the Sound / Forest to the Sea	Observ-ational Ocean-ography	PWSSC Fellow-ship	Totals 2008	Totals 2007
Revenues:						
Federal grants, contracts, and contributions	$ 1,067,647	66,000	171,029	71,750	1,376,426	1,027,163
Interest income	10,450	-	-	-	10,450	46,543
Investment income (loss)	(47,948)	-	-	-	(47,948)	144,561
Total revenues	1,030,149	66,000	171,029	71,750	1,338,928	1,218,267
Expenses:						
Salaries and benefits	219,301	48,581	68,847	58,132	394,861	360,707
Travel	23,392	3,489	7,256	464	34,601	27,061
Professional services	11,732	250	8,906	100	20,988	21,217
Subcontracts and charter costs	-	-	16,289	-	16,289	20,818
Supplies	2,779	604	15,389	70	18,842	11,456
Telephone	1,506	-	590	172	2,268	5,531
Postage and freight	95	-	2,128	-	2,223	3,246
Printing, publications and copying	2,006	-	26	-	2,032	2,195
Utilities	8,000	-	-	-	8,000	6,205
Insurance	2,788	-	-	-	2,788	2,787
Equipment rental and maintenance	464	-	3,224	-	3,688	11,231
Advertising	-	-	25	-	25	1,839
Other	1,321	210	70	-	1,601	2,947
Grants awarded	755,138	-	-	-	755,138	467,978
Total expenses before interfund facility and equipment costs and indirect costs	1,028,522	53,134	122,750	58,938	1,263,344	945,218
Interfund facility and equipment costs	13,140	-	-	-	13,140	13,140
Indirect costs	-	12,866	33,248	12,812	58,926	52,284
Total expenses	1,041,662	66,000	155,998	71,750	1,335,410	1,010,642
Change in net assets	(11,513)	-	15,031	-	3,518	207,625
Net assets at beginning of year	1,606,784	-	-	-	1,606,784	1,415,678
Transfers to Plant Fund	(25,984)	-	(15,031)	-	(41,015)	(16,519)
Net assets at end of year	$ 1,569,287	-	-	-	1,569,287	1,606,784

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Financial Position – Exxon Valdez Oil Spill Trustee Council (EVOS) Programs

September 30, 2008

(With Comparative Totals for 2007)

		Herring Plan	Trophic Dynamics	Herring Ocean	Herring Thorne	Herring Forage	Seabird Predation	Totals 2008	Totals 2007
Assets									
Current assets - receivables - federal grants, contracts, and contributions	$	12,772	-	29,982	331	52,048	11,720	106,853	151,664
Liabilities and Net Assets									
Liabilities - due to other funds		12,772	-	29,982	331	52,048	11,720	106,853	151,664
Net assets - unrestricted		-	-	-	-	-	-	-	-
Total liabilities and net assets	$	12,772	-	29,982	331	52,048	11,720	106,853	151,664

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Activities – Exxon Valdez Oil Spill Trustee Council (EVOS) Programs

Year Ended September 30, 2008

(With Comparative Totals for 2007)

	Herring Planning	Trophic Dynamics	Herring Ocean	Herring Thorne	Herring Forage	Seabird Predation	Totals 2008	Totals 2007
Revenues - federal grants, contracts, and contributions	$ 12,772	6,357	71,084	60,664	241,485	107,250	499,612	519,534
Expenses:								
Salaries and benefits	10,244	1,265	21,145	5,395	119,737	80,505	238,291	224,366
Travel	-	-	-	1,186	2,355	1,707	5,248	15,597
Professional services	-	-	400	-	11,295	-	11,695	27,243
Subcontracts and charter costs	-	4,778	28,236	41,396	37,601	-	112,011	106,550
Supplies	-	-	2,704	151	14,478	646	17,979	12,780
Telephone	-	1	71	241	769	1,068	2,150	3,980
Postage and freight	-	-	436	3	113	120	672	979
Printing, publications and copying	-	-	1	-	86	115	202	861
Facilities and rent expense	-	-	-	-	-	559	559	-
Utilities	-	-	-	284	-	-	284	-
Equipment rental and maintenance	-	-	4,020	-	30	-	4,050	8,310
Advertising	-	-	-	-	62	-	62	130
Other	-	-	-	-	-	439	439	237
Total expenses before interfund facility and equipment costs and indirect costs	10,244	6,044	57,013	48,656	186,526	85,159	393,642	401,033
Interfund facility and equipment costs	-		-	-	1,845	-	1,845	1,449
Indirect costs	2,528	313	14,071	12,008	47,922	21,230	98,072	94,426
Total expenses	12,772	6,357	71,084	60,664	236,293	106,389	493,559	496,908
Change in net assets	-	-	-	-	5,192	861	6,053	22,626
Net assets at beginning of year	-	-	-	-	-	-	-	-
Transfers to Plant Fund	-	-	-	-	(5,192)	(861)	(6,053)	(22,626)
Net assets at end of year	$ -	-	-	-	-	-	-	-

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)
Combining Schedule of Financial Position
Other Government Programs
September 30, 2008
(With Comparative Totals for 2007)

	Alaska OOS	PWS OOS	NPRB AOOS Schoch	NPRB Bishop	NMFS PWS Sea Lions	NPS Long Lake Weir	ADF&G Beluga Invasive Species	Totals 2008	Totals 2007
Assets									
Current assets - receivables - federal grants, contracts, and contributions	$ 44,921	43,145	44,998	20,043	18,889	3,117	17,967	193,080	128,451
Liabilities and Net Assets									
Current liabilities - due to other funds	44,921	43,145	44,998	20,043	18,889	3,117	17,967	193,080	128,451
Net assets - unrestricted	-	-	-	-	-	-	-	-	-
Total liabilities and net assets	$ 44,921	43,145	44,998	20,043	18,889	3,117	17,967	193,080	128,451

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities
Other Government Programs
Year Ended September 30, 2008
(With Comparative Totals for 2007)

	Alaska OOS	PWS OOS	NPRB AOOS Schoch	NPRB Bishop	NMFS PWS Sea Lions	NPS Long Lake Weir	ADF&G Beluga Invasive Species	Totals 2008	Totals 2007
Revenues - federal grants, contracts, and contributions	$ 169,256	92,580	205,979	74,689	410,665	12,468	19,311	984,948	810,893
Expenses:									
Salaries and benefits	3,402	-	20,674	22,678	277,997	-	10,796	335,547	324,683
Travel	1,521	233	-	-	18,242	-	2,716	22,712	24,030
Professional services	2,968	1,511	-	-	5,250	-	-	9,729	14,479
Subcontracts and charter costs	96,952	74,863	175,000	41,388	20,443	10,000	827	419,473	223,190
Supplies	3,061	24	-	126	3,132	-	419	6,762	31,371
Telephone	3	-	-	-	976	-	108	1,087	4,779
Postage and freight	1,097	105	-	-	25	-	-	1,227	1,444
Printing, publications and copying	8	2,206	-	-	303	-	3	2,520	323
Utilities	-	-	-	-	453	-	-	453	507
Facilities and rent expense	-	-	-	-	-	-	-	-	729
Equipment rental and maintenance	49,144	3,113	-	-	-	-	-	52,257	21,617
Advertising	-	-	-	-	-	-	-	-	93
Other	435	-	-	-	935	-	20	1,390	2,055
Total expenses before interfund facility and equipment costs and indirect costs	158,591	82,055	195,674	64,192	327,756	10,000	14,889	853,157	649,300
Interfund facility and equipment costs	-	-	-	-	-	-	600	600	-
Indirect costs	9,326	(2)	10,305	10,497	79,660	2,468	3,822	116,076	140,676
Total expenses	167,917	82,053	205,979	74,689	407,416	12,468	19,311	969,833	789,976
Change in net assets	1,339	10,527	-	-	3,249	-	-	15,115	20,917
Net assets at beginning of year	-	-	-	-	-	-	-	-	-
Transfers to Plant Fund	(1,339)	(10,527)	-	-	(3,249)	-	-	(15,115)	(20,917)
Net assets at end of year	$ -	-	-	-	-	-	-	-	-

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Combining Schedule of Financial Position
Other Programs
September 30, 2008
(With Comparative Totals for 2007)

		Community Education / Science Camp	Murdock Zoo-plankton	Ras-muson Bishop	NOAA Whittier Reef	GIS Ecotrust	RPG Data	POST Lingcod	Misc-ellaneous Grants	Totals 2008	Totals 2007
Assets											
Current assets:											
Receivables:											
Federal grants, contracts, and contributions	$	-	-	-	-	-	-	-	5,500	5,500	-
Other grants, contracts, and contributions		6,458	1,080	-	-	3,439	-	46,715	41	57,733	27,234
Due from other funds		21,189	-	-	-	-	-	-	-	21,189	4,546
Total assets	$	27,647	1,080	-	-	3,439	-	46,715	5,541	84,422	31,780
Liabilities and Net Assets											
Current liabilities:											
Deferred revenue		26,829	-	-	-	-	-	-	-	26,829	4,546
Due to other funds		818	1,080	-	-	3,439	-	46,715	5,541	57,593	27,234
Total current liabilities		27,647	1,080	-	-	3,439	-	46,715	5,541	84,422	31,780
Net assets - unrestricted		-	-	-	-	-	-	-	-	-	-
Total liabilities and net assets	$	27,647	1,080	-	-	3,439	-	46,715	5,541	84,422	31,780

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities
Other Programs
Year Ended September 30, 2008
(With Comparative Totals for 2007)

	Community Education / Science Camp	Murdock Zoo-plankton	Ras-muson Bishop	NOAA Whittier Reef	GIS Ecotrust	RPG Data	POST Lingcod	Misc-ellaneous Grants	Totals 2008	Totals 2007
Revenues - grants, contracts, and contributions:										
Federal	$ -	-	-	3,931	-	-	-	10,408	14,339	-
Other	95,618	70,373	20,750	-	33,396	7,680	46,715	10,922	285,454	268,199
Total revenues	95,618	70,373	20,750	3,931	33,396	7,680	46,715	21,330	299,793	268,199
Expenses:										
Salaries and benefits	63,674	29,757	-	207	33,396	-	-	10,994	138,028	157,153
Travel	5,791	-	-	1,124	-	-	25	50	6,990	4,546
Professional services	5,815	4,500	-	-	-	-	-	-	10,315	408
Subcontracts and charter costs	-	32,655	-	-	-	6,160	-	6,726	45,541	42,963
Supplies	6,931	(170)	-	-	-	-	3,050	181	9,992	4,752
Telephone	1,364	345	-	-	-	-	-	-	1,709	2,173
Postage and freight	108	103	-	-	-	-	2,561	141	2,913	436
Printing, publications and copying	827	-	-	-	-	-	60	-	887	1,050
Facilities and rent expense	-	-	-	-	-	-	-	-	-	25
Equipment rental and maintenance	1,736	65	-	1,820	-	-	7,356	-	10,977	16,717
Advertising	364	25	-	-	-	-	-	-	389	376
Other	316	-	-	-	-	-	-	-	316	1,533
Total expenses before interfund facility and equipment costs and indirect costs	86,926	67,280	-	3,151	33,396	6,160	13,052	18,092	228,057	232,132
Interfund facility and equipment costs	-	3,093	-	-	-	-	-	-	3,093	-
Indirect costs	8,692	-	-	780	-	1,520	1,406	3,238	15,636	17,758
Total expenses	95,618	70,373	-	3,931	33,396	7,680	14,458	21,330	246,786	249,890
Change in net assets	-	-	20,750	-	-	-	32,257	-	53,007	18,309
Net assets at beginning of year	-	-	-	-	-	-	-	-	-	-
Transfers to Plant Fund	-	-	(20,750)	-	-	-	(32,257)	-	(53,007)	(18,309)
Net assets at end of year	$ -	-	-	-	-	-	-	-	-	-

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Financial Statements and Supplementary Information

Year Ended September 30, 2010

(With Independent Auditor's Report Thereon)

(This page left blank intentionally)

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Table of Contents

(This page left blank intentionally)

Mikunda, Cottrell & Co., Inc.
Certified Public Accountants & Consultants

An Independently Owned Member
McGLADREY ALLIANCE | McGladrey

Offices in Anchorage & Kenai

Independent Auditor's Report

The Board of Directors
Prince William Sound Science and Technology Institute
(d.b.a. Prince William Sound Science Center)
Cordova, Alaska

We have audited the accompanying statement of financial position of Prince William Sound Science and Technology Institute (d.b.a. Prince William Sound Science Center) as of September 30, 2010, and the related statements of activities and cash flows for the year then ended. These financial statements are the responsibility of the Prince William Sound Science Center's management. Our responsibility is to express an opinion on these financial statements based on our audit. The prior year summarized comparative information has been derived from the Prince William Sound Science Center's 2009 financial statements, and in our report dated February 4, 2010, we expressed an unqualified opinion on those financial statements.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards,* issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and the significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of Prince William Sound Science Center as of September 30, 2010, and the changes in its net assets and its cash flows for the year then ended in conformity with accounting principles generally accepted in the United States of America.

In accordance with *Government Auditing Standards,* we have also issued our report dated January 28, 2011 on our consideration of Prince William Sound Science Center's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on the internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* and should be considered in assessing the results of our audit.

3601 "C" Street, Suite 600 * Anchorage, Alaska 99503 * (907) 278-8878 * Fax (907) 278-5779 * www.mcc-cpa.com

The Board of Directors
Prince William Sound Science and Technology Institute
(d.b.a. Prince William Sound Science Center)

Our audit was conducted for the purpose of forming an opinion on the basic financial statements taken as a whole. The supplementary information included on pages 18-27 is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the audit of the basic financial statements and, in our opinion, is fairly stated, in all material respects, in relation to the basic financial statements taken as a whole.

Mikunda, Cottrell & Co.

Anchorage, Alaska
January 28, 2011

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)
Statement of Financial Position
September 30, 2010
(With Comparative Totals for 2009)

	General Fund	Plant Fund	Program Funds	Totals 2010	Totals 2009
Assets					
Current assets:					
Cash and cash equivalents	$ 19,860	-	67,254	87,114	177,889
Receivables:					
Trade	-	-	-	-	369
Government grants	-	-	193,718	193,718	229,184
Government service contracts	-	-	3,477	3,477	-
Other	-	-	59,311	59,311	4,800
Prepaids and other assets	40,817	-	-	40,817	51,546
Due from other funds	296,050	-	65,777	361,827	292,709
Leasehold, current portion	1,500	-	-	1,500	18,000
Total current assets	358,227	-	389,537	747,764	774,497
Investments	-	-	1,766,497	1,766,497	2,148,730
Leasehold, long-term portion	-	-	-	-	1,500
Property and equipment, net of accumulated depreciation	-	902,453	-	902,453	832,548
Total assets	$ 358,227	902,453	2,156,034	3,416,714	3,757,275
Liabilities and Net Assets					
Current liabilities:					
Accounts payable	173,217	-	-	173,217	152,827
Wages, taxes and benefits payable	133,146	-	-	133,146	147,023
Current portion of long-term debt	-	-	11,645	11,645	-
Deferred revenue	7,835	-	124,296	132,131	644,208
Due to other funds	65,777	-	296,050	361,827	292,709
Total current liabilities	379,975	-	431,991	811,966	1,236,767
Long-term debt	-	-	107,437	107,437	-
Total liabilities	379,975	-	539,428	919,403	1,236,767
Net assets:					
Temporarily restricted	1,500	-	-	1,500	19,500
Unrestricted (deficit)	(23,248)	902,453	1,616,606	2,495,811	2,501,008
Total net assets (deficit)	(21,748)	902,453	1,616,606	2,497,311	2,520,508
Total liabilities and net assets	$ 358,227	902,453	2,156,034	3,416,714	3,757,275

See accompanying notes to financial statements.

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)
Statement of Activities
Year Ended September 30, 2010
(With Comparative Totals for 2009)

	General Fund	Plant Fund	Program Funds	Totals 2010	Totals 2009
Revenues:					
Grants, contracts and contributions:					
Government grants	$ -	-	2,438,715	2,438,715	2,449,315
Government service contracts	-	-	64,545	64,545	18,061
Other	88,957	-	200,149	289,106	248,807
Total grants, contracts and contributions	88,957	-	2,703,409	2,792,366	2,716,183
Interest income	34	-	164	198	3,451
Investment income	-	-	123,463	123,463	67,195
Total revenues	88,991	-	2,827,036	2,916,027	2,786,829
Net assets released from restrictions due to passage of time	18,000	-	-	18,000	18,000
Total unrestricted revenues	106,991	-	2,827,036	2,934,027	2,804,829
Expenses:					
Salaries and benefits	328,796	-	1,089,619	1,418,415	1,295,532
Travel	37,400	-	77,914	115,314	106,254
Professional services	46,453	-	75,304	121,757	112,870
Subcontracts and charter costs	-	-	463,647	463,647	436,357
Supplies	10,668	-	124,619	135,287	55,331
Telephone	3,171	-	6,905	10,076	17,503
Network	6,501	-	16,077	22,578	-
Postage and freight	1,791	-	4,403	6,194	7,350
Printing, publications and copying	10,693	-	4,129	14,822	24,705
Facilities and rent expense	39,851	-	2,467	42,318	32,790
Utilities	12,931	-	9,150	22,081	23,222
Insurance	30,191	-	4,394	34,585	33,414
Equipment rental and maintenance	2,982	-	19,780	22,762	32,302
Advertising	887	-	1,680	2,567	2,374
Other	13,722	-	16,614	30,336	23,787
Grants awarded	-	-	295,005	295,005	338,532
Amortization and depreciation	-	181,480	-	181,480	187,586
Total expenses before interfund costs and indirect costs	546,037	181,480	2,211,707	2,939,224	2,729,909
Interfund facility and equipment costs (reimbursement)	(16,437)	-	16,437	-	-
Indirect costs (reimbursement)	(400,230)	-	400,230	-	-
Total expenses	129,370	181,480	2,628,374	2,939,224	2,729,909
Increase (decrease) in unrestricted net assets	(22,379)	(181,480)	198,662	(5,197)	74,920
Decrease in temporarily restricted net assets - net assets released from restriction	(18,000)	-	-	(18,000)	(18,000)
Change in net assets	(40,379)	(181,480)	198,662	(23,197)	56,920
Net assets at beginning of year	48,278	832,548	1,639,682	2,520,508	2,463,588
Transfers from General Fund and Program Funds	-	251,385	-	251,385	252,692
Transfers to Plant Fund	(29,647)	-	(221,738)	(251,385)	(252,692)
Net assets (deficit) at end of year	$ (21,748)	902,453	1,616,606	2,497,311	2,520,508

See accompanying notes to financial statements.

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Statement of Cash Flows
Year Ended September 30, 2010
(With Comparative Totals for 2009)

	General Fund	Plant Fund	Program Funds	Totals 2010	Totals 2009
Cash flows from operating activities:					
Change in net assets	$ (40,379)	(181,480)	198,662	(23,197)	56,920
Adjustments to reconcile change in net assets to net cash provided (used) by operating activities:					
Amortization and depreciation	-	181,480	-	181,480	187,586
Gains on investments	-	-	(23,552)	(23,552)	(19,847)
(Increase) decrease in assets:					
Receivables	369	-	(22,522)	(22,153)	136,705
Prepaids and other assets	10,729	-	-	10,729	7,089
Due from other funds	(35,147)	-	(33,971)	(69,118)	208,629
Interest receivable	-	-	-	-	8,155
Leasehold	18,000	-	-	18,000	18,000
Increase (decrease) in liabilities:					
Accounts payable	20,390	-	-	20,390	(164,449)
Wages, taxes and benefits payable	(13,877)	-	-	(13,877)	27,788
Deferred revenue	(13,026)	-	(499,051)	(512,077)	2,734
Due to other funds	33,971	-	35,147	69,118	(208,629)
Net cash provided (used) by operating activities	(18,970)	-	(345,287)	(364,257)	260,681
Cash flows from investing activities:					
Purchase of investments	-	-	(1,911,653)	(1,911,653)	(705,744)
Proceeds from maturities of investments	-	-	2,317,438	2,317,438	702,291
Additions to property and equipment	(29,647)	-	(221,738)	(251,385)	(252,692)
Net cash provided (used) by investing activities	(29,647)	-	184,047	154,400	(256,145)
Cash flows from financing activities:					
Proceeds from issuance of long term debt	-	-	126,000	126,000	-
Principal payments on long term debt	-	-	(6,918)	(6,918)	-
Net cash provided by financing activities	-	-	119,082	119,082	-
Net increase (decrease) in cash	(48,617)	-	(42,158)	(90,775)	4,536
Cash at beginning of year	68,477	-	109,412	177,889	173,353
Cash at end of year	$ 19,860	-	67,254	87,114	177,889

See accompanying notes to financial statements.

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Notes to Financial Statements

September 30, 2010

(1) Organization and Summary of Significant Accounting Policies

Organization

Prince William Sound Science and Technology Institute (d.b.a. Prince William Sound Science Center) (Center) was formed in 1989 as an Alaska not-for-profit scientific research and education corporation to contribute to the comprehensive description, sustained monitoring and ecological understanding of Prince William Sound, the Copper River, and Gulf of Alaska. Establishment of the Center followed the Exxon Valdez oil spill although planning of this institution preceded that event. The underlying philosophy of the Center is to serve as a model for long-term ecosystem management. Operations are financed principally by public contributions and grants from industry and various governmental agencies.

Basis of Accounting

The financial statements of the Center have been prepared on the accrual basis of accounting and in accordance with policies consistent with those prescribed by the Audit and Accounting Guide for Not-for-Profit Organizations, issued by the American Institute of Certified Public Accountants. In order to ensure observation of limitations and restrictions placed on the use of resources available to the Center, the accounts are maintained in accordance with the principles of fund accounting. This is the procedure by which resources for various purposes are classified for accounting and reporting purposes into funds established according to their nature and purpose. As a result, the Center has adopted the following funds:

General – Accounts for the supporting services of the Center and all transactions not accounted for in the program funds or plant fund.

Plant – Accounts for the ownership of property and equipment.

Program – Accounts for expendable funds restricted by the donor, grantor or other outside party for a specific purpose or program.

Net assets and revenues, expenses, gains and losses are classified based on the existence or absence of donor-imposed restrictions. Accordingly, net assets of the Center and changes therein are reported as follows:

Unrestricted Net Assets – Net assets that are not subject to donor-imposed stipulations.

Organization and Summary of Significant Accounting Policies, continued

Basis of Accounting, continued

Temporarily Restricted Net Assets – Temporarily restricted resources are restricted by the donor, grantor or other outside parties whose restrictions either expire by the passage of time or can be fulfilled and removed by actions of the Center. Revenues associated with these resources are earned when the Center undertakes the necessary action or other restrictions are met. When a donor restriction expires, that is, when a stipulated time restriction ends or a purpose restriction is accomplished, temporarily restricted net assets are reclassified to unrestricted net assets and reported in the statement of activities as net assets released from restriction. Revenues associated with restricted contributions received during the reporting period which are met during the reporting period are recorded as unrestricted revenues.

Management Estimates

In preparing the financial statements, management is required to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the statement of financial position, and revenues and expenses for the period. Actual results could differ from those estimates and assumptions.

Support and Revenues

Operating moneys restricted by the grantor are deemed to be earned and reported as revenues when the Center has incurred costs in compliance with the specific restrictions. Such amounts received but not earned are reported as deferred revenue.

Indirect Costs

Indirect costs include overhead allocations for space, equipment, salaries, utilities, and certain other costs paid for by the General Fund and allocable to the program funds.

Investments

The Center records investments at fair value. On October 1, 2008, FASB Accounting Standards Codification (FASB ASC) 958.205 (formerly FAS157), Fair Value Measurements, went into effect at the Center. FASB ASC 958.205 defines fair value, establishes a hierarchy for measuring fair value in generally accepted accounting principles (GAAP), and expands disclosures about fair value measurements. The Statement requires that assets and liabilities carried at fair value to be classified and disclosed in one of the following three input categories:

Level 1 – Quoted market prices in active markets for identical assets or liabilities.

Level 2 – Observable market based inputs or unobservable inputs that are corroborated by market data.

Organization and Summary of Significant Accounting Policies, continued
Investments, continued

Level 3 – Unobservable inputs that are not corroborated by market data.

Property and Equipment
Field and office equipment and furnishings are recorded at cost or, in the case of donated property, at the estimated fair value on the date of receipt. Depreciation is calculated on a straight-line basis over the estimated useful lives of the assets. Leasehold improvements are carried at cost and are amortized on a straight-line basis over the life of the lease or life of the improvement, whichever is less. Property and equipment financed by certain grantors in the program funds remain the property of the grantor and as such are recorded as expenditures in the program funds. Expenditures for repairs and maintenance are charged to operations, as incurred.

Income Tax Status
The Center qualifies as a not-for-profit corporation under Section 501(c) (3) of the Internal Revenue Code and therefore, is not subject to federal or state income tax on its qualifying exempt activities.

Subsequent Events
Management of the Center has evaluated subsequent events through January 28, 2011, the date on which the financial statements were issued.

(2) **Program Classifications**
Program funds consist of the following:

Oil Spill Recovery Institute (OSRI)
This program funds the administration and awards of the Oil Spill Recovery Institute, a federally established program to improve technologies for prevention and response to oil pollution issues in the Arctic and Subarctic; and, also to investigate the environmental and socio-economic impact of oil spills in the Arctic and Subarctic marine environments. Beginning in 1997, funding is provided directly from the interest earnings on a $22.4 million fund administered by the U.S. Coast Guard (through the National Oil Spill Liability Trust Fund). The Institute is governed by an Advisory Board which includes representatives from Federal and State agencies, Alaska Native and Prince William Sound (PWS) community, and industry representatives appointed by the Governor of Alaska. The Advisory Board Chair is a U.S. Department of Commerce representative.

Program Classifications, continued

OSRI - Community Education Programs – Science of the Sound / Forest to the Sea

The Science of the Sound program has three major components: (1) the Discovery Room, a program which supplements elementary school science education in the community; (2) Summer Science Camp, "From the Forest to the Sea", offering residential camp sessions to ages 7-15 and families; and (3) Regional Outreach, a program that delivers science and environmental education to the remote communities of Prince William Sound. Funding for these programs come from OSRI, corporate and foundation donations, camp revenues, and a partnership program with the U.S. Forest Service, which provides in-kind donations of salaries and supplies.

Observational Oceanography

OSRI funds PWSSC for an observational oceanography program for multiple purposes. The primary sub-program of three is to provide an improved description of the flow through the straits connecting PWS with the Gulf of Alaska (GOA). This objective is a necessary step towards a better understanding of the relationship between circulation variability and biological variability in PWS. A second sub-program aims to acquire a description of the seasonal evolution of the hydrographic properties and circulation in the central basin of PWS. A third observational program aims at acquiring a better knowledge on the spatial and temporal variability of the effects of freshwater runoff in the near shore area of PWS.

PWSSC Fellowships

Three OSRI funded fellowships for PWSSC Biological Researchers were conducted this year. 1) to identify Forage Fish Habitat near Alaskan coastal shelf areas in the Beaufort and Chukchi seas, 2) to develop a plan for creating a synthesis of ecological research related to Prince William Sound, and 3) support "Tracking Movements of Lingcod in PWS using Acoustic Tags and Arrays". This is a matching award to a Pacific Coast Shelf Tracking (POST) project.

PWS Herring Survey Program

This is an EVOS Trustee Council funded program to better understand conditions that may be limiting herring recovery. The program is made up of ten individual studies that include studies conducted by the Prince William Sound Science Center, National Oceanic and Atmospheric Administration, United States Geologic Survey, Cordova District Fishermen United, Flying Fish Ltd., United States Fish and Wildlife Service, and the University of South Alabama. It is through a coordinated effort that we hope to learn which aspects of a juvenile herring's life is most likely limiting recruitment to the fishery.

The following projects are lead by PWSSC PI's:

- PWS herring survey: Community involvement, Outreach, Logistics, and Synthesis
- PWS herring survey: Assessment of Juvenile Herring Abundance and Habitat Utilization

Program Classifications, continued

PWS Herring Survey Program continued

- PWS herring survey: Plankton and oceanic observations in PWS
- PWS herring survey: Physical Oceanographic Characteristics of Nursery Habitats Influencing Growth, Over-Winter Energetics and Survival of Juvenile Pacific Herring
- PWS herring survey: Pacific Herring Energetic Recruitment Factors
- PWS herring survey: Seabird predation on juvenile herring in Prince William Sound
- PWS herring survey: Top-down regulation by predatory fish on juvenile herring

Balloon Experiment

OSRI is funding the PWSSC to conduct a "Demonstration of a tethered balloon surveillance spill detection system". A balloon-based visible and infrared surveillance system was purchased and tested to demonstrate its usefulness in Arctic and Sub-Arctic areas for oil spill monitoring.

AOOS - Alaska Ocean Observing System

This project, funded by NOAA via the Alaska Ocean Observing System continues implementation of the Prince William Sound (PWS) Observing System (PWSOS). The PWSOS collects ocean, atmospheric and biological observations for use by stakeholders and develops and tests forecast models as a demonstration of an end-to-end observing system in Alaska. PWSOS has supported development of a suite of ocean current, ocean wave, atmospheric and biological forecast models for use in PWS and elsewhere in the state. Among these models was development of a real-time data assimilated ROMS ocean circulation model and the coupling of an NPZ biological model with the ROMS model. In July and August 2009, a major field experiment was conducted to test these models; results from that experiment are currently being analyzed and multiple publications are in process, scheduled for completion in spring 2011.

Monitoring: NFWF/NPRB

PWSSC Community Education projects funded by additional sources for student education include: 1)National Fish and Wildlife Foundation (NFWF) for the Discovery Monitoring Program for Marine Debris and Climate Change and 2)North Pacific Research Board (NPRB) for the Eyak Lake Community Monitoring Project to collect water quality data.

Murrelet: NPRB

North Pacific Research Board funded project on the effects of the decline of Juvenile Herring on Marbled Murrelet population in Prince William Sound.

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Notes to Financial Statements, continued

Program Classifications, continued

Surfbirds: ADF&G/NFWF

Montague Island: A Crucial Stopover for Surfbirds and Black Turnstones project funded by the Alaska Dept. of Fish and Game, National Fish & Wildlife Foundation and an OSRI Fellowship. This project looks at the spring migration, population size and areas of concentration of Surfbirds and Turnstones in response to herring spawn.

USGS Climate Change

This project funded by and partnered with the U.S. Geological Survey examines climate change impacts on the Gulf of Alaska ecosystems. The hypothesize is that climate change and the rapid melting of Mountain glaciers are leading to increased discharge of fresh river and estuarine minerals that impact phytoplankton productivity and food chain dynamics of the near-shore biological community. This effort is focused on the glacially controlled Copper River that receives the cumulative impact of the glaciers of the Wrangell-St. Elias Mountains.

NASA Nutrient Flux

This partnership funded by NASA collaborates with U.S. Geological Survey, The University of Maine, University of Alaska, Anchorage and the U. of Baltimore/NASA to further explore the nutrient flux experienced by the Copper River and the Gulf of Alaska from climate change impacts on the Wrangell-St. Elias Mountains by monitoring glacial, stream/river, oceanographic and atmospheric observations made by sampling and NASA Satellites.

H2O – Headwater to Oceans

Funding for this project is from the Paul Allen Foundation. The Headwaters to Ocean (H2O) project is developing web based capacity to integrate and visualize natural resource information from mountaintop to the continental shelf break. The challenge is in creating applications and functions that can support diverse educational activities. This project is convening regional education leaders to work with the H2O scientists and programmers to plan and develop in-school, home school, and informal science education applications that support curriculum standards based lesson plans.

This project is funded by the Pacific Ocean Shelf Tracking (POST) Project. This is for work titled "Tracking Movements of Lingcod Ophiodon elongates in Prince William Sound using Acoustic Tags and Arrays: Expanding Local Infrastructure and Capacity." Acoustic tags are placed on lingcod in Prince William Sound. With the help of the Ocean Tracking Network (OTN), the tagged fish will then be monitored from acoustic arrays installed at the entrances to and selected bays in Prince William Sound and to detect lingcod movement in and out, and around the Sound. This project will use radio telemetry equipment upgrades funded by the Rasmuson Foundation.

Program Classifications, continued

Misc. Grants

Miscellaneous small PWSSC projects noted in the audit schedules. Rasmussen Foundation award for a Nutrient Winch, NOAA funded NOPP Nutrient Sensor, U.S. Fish & Wildlife Caspian Tern

Functional Expenses

Program Funds on the Statement of Activities is comprised of four functional project areas: OSRI, EVOS, Government, and Other Projects. Each functional area had the following expenses for each of the years ending September 30:

	2010	2009
OSRI	$ 761,029	930,038
EVOS	1,074,441	700,809
Government	563,131	605,869
Other	229,773	179,676
	$ 2,628,374	2,416,392

(3) **Cash**

Financial instruments that potentially subject the Center to concentrations of credit risk consist principally of cash deposits. Accounts are insured by the Federal Deposit Insurance Corporation (FDIC) up to $250,000 at September 30, 2010 and 2009, respectively. At September 30, 2010 and 2009, the Center did not have any cash deposits in excess of FDIC insured limits.

(4) **Investments**

Investments held by the Center for the Oil Spill Recovery Institute program are held at fair value, and determined through Level 1 inputs as described under Investments in note 1. Investments consist of the following at September 30, 2010 and 2009:

	2010		2009	
	Cost	Fair Value	Cost	Fair Value
Government securities	$ 146,253	151,192	263,974	268,386
Corporate bonds	1,002,256	993,142	546,191	579,490
Certificates of deposit	658,446	622,163	1,526,337	1,300,854
	$ 1,806,955	1,766,497	2,336,502	2,148,730

Investments, continued

Investments in equity securities are held through an investment broker. The broker is a member of the Securities Investor Protection Corporation (SIPC) established by Congress in 1970. If the broker-dealer fails, SIPC funds are available to make up any shortfall in client assets that the broker-dealer was required to maintain up to a maximum of $500,000 for securities, and inclusive of up to $100,000 of cash.

The Center's total investment balance which includes equity securities, debt securities, and cash and money market funds, which are included in cash and cash equivalents, and investments on the statement of financial position, was $1,778,746 and $2,220,283 at September 30, 2010 and 2009, respectively.

Investment income consisted of the following for the years ended September 30, 2010 and 2009:

	2010	2009
Interest and dividends	$ 101,845	92,631
Investment fees	(1,934)	(5,247)
Unrealized gain	147,314	13,156
Realized gain (loss)	(123,762)	(33,345)
	$ 123,463	67,195

(5) Property and Equipment

Property and equipment consisted of the following at September 30, 2010 and 2009:

	2010	2009
Property and equipment:		
Field equipment	$ 1,659,295	1,412,136
Office equipment	227,659	223,432
Furnishings	45,965	45,965
Leasehold improvements	538,966	538,966
	2,471,885	2,220,499
Accumulated depreciation	(1,569,432)	(1,387,951)
Property and equipment, net of accumulated depreciation	$ 902,453	832,548

Depreciation expense for 2010 and 2009 was $181,480 and $187,586, respectively.

(6) **Long-Term Debt**

Long-term debt at September 30, 2010, is summarized as follows:

Note payable to First National Bank of Alaska, due in monthly installments of $1,219, including variable interest at 2.00% above prime (with the exception that the rate never falls below 7.00%), secured by real property, and maturing March 1, 2020. The interest rate at September 30, 2010 was 7.00%.	$ 100,360
Note payable to First National Bank of Alaska, due in monthly installments of $416, including variable interest at 2.00% above prime (with the exception that the rate never falls below 7.00%), secured by real property, and maturing March 1, 2015. The interest rate at September 30, 2010 was 7.00%.	18,722
Total long-term debt	119,082
Less current portion	(11,645)
Long-term debt, net of current portion	$ 107,437

Principal maturities of long-term debt are as follows:

Year ended September 30,	
2011	$ 11,645
2012	12,487
2013	13,390
2014	14,358
2015	12,178
Due in subsequent years	55,024
	$ 119,082

(7) **Temporarily Restricted – Operating Lease**

The Center entered into a 10-year operating lease commencing November 2, 2000 with the City of Cordova for the building and dock that it occupies. The annual lease payment is $1. The estimated fair value of the remaining lease term is recorded as a temporarily restricted asset on the statement of financial position. The annual lease benefit is recorded as net assets released from restriction and facilities and equipment rent on the statement of activities. At September 30, 2010 and 2009, the future lease benefit was estimated at $1,500 and $19,500, respectively. The lease benefit was estimated at $18,000 for each of the fiscal years 2010 and 2009.

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)

Notes to Financial Statements, continued

(8) **Annuity Program**

The Center provides a qualified 403(b) plan to its employees. The plan, which is voluntary, allows employees to contribute up to 20% of their base salary, subject to Internal Revenue Service limitations, and requires the employer to match contributions up to 6% of a participant's base compensation. Employees are 100% vested in employer contributions after three years of service. Employer contributions were $33,550 and $34,121 for the years ended September 30, 2010 and 2009, respectively. The program's custodian is Nationwide Life Insurance Company.

(9) **Concentrations of Risk and Contingency**

The Center receives the majority of its funding through the Oil Spill Recovery Institute and the Exxon Valdez Oil Spill (EVOS) Trustee Council along with other state and federal government agencies. Changes in those agencies could have a detrimental effect on the Center's financial position.

Expenditures made pursuant to grants and contracts are subject to audit by governmental agencies or their representatives. Management of the Center believes that no significant liabilities will result from any such audits and, accordingly, no provision for liability is included in the accompanying financial statements.

(10) **Cash – Restricted and Unrestricted**

	General	Program	Totals	
	Fund	Funds	2010	2009
Cash:				
Unrestricted	$ 19,860	67,254	87,114	177,889
Deferred revenue:				
Conoco Phillips – Facilities	(400)	-	(400)	(5,976)
Treadwell Scholarship Fund	(7,035)	-	(7,035)	(10,710)
Maintenance Endowment	(400)	-	(400)	(4,175)
Oil Spill Recovery Institute	-	(48,128)	(48,128)	(591,541)
Community Education	-	(30,312)	(30,312)	(16,446)
Paul Allen Foundation	-	(37,277)	(37,277)	(37,277)
POST – Lingcod	-	(3,579)	(3,579)	(15,360)
Bishop Donated Funds	-	(5,000)	(5,000)	-
	(7,835)	(124,296)	(132,131)	(644,208)
	$ 12,025	(57,042)	(45,017)	(466,319)

(11) **Net Assets – Unrestricted**

Unrestricted net assets consist of the following at September 30, 2010 and 2009:

	General and Plant Fund	Program Funds	Totals 2010	2009
Unrestricted, designated for:				
Operations	$ (23,248)	(27,621)	(50,869)	28,778
OSRI reserve	-	1,644,227	1,644,227	1,639,682
Property and equipment	902,453	-	902,453	832,548
Unrestricted net assets	$ 879,205	1,616,606	2,495,811	2,501,008

Operations

This amount is based on prior year contributions from Memberships, Corporate Sponsors and the Copper River Nouveau for Discretionary and Operating funds.

OSRI Reserve

Investments in the Program Funds are for the Oil Spill Recovery Institute (OSRI). The use of these investment funds are determined by the Oil Spill Recovery Institute Advisory Board at their annual meeting as put before the Board by the Directors. The unrestricted amount of $1,644,227 is interest earned since inception above the capital amount. With the current economic downtrend, anticipated deposits from the National Oil Spill Liability Trust Fund to the Oil Spill Recovery Institute will be significantly reduced. This will require OSRI to use more of the Reserve for its Program over the next few years.

SUPPLEMENTARY INFORMATION

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Financial Position - All Program Funds

September 30, 2010

(With Comparative Totals for 2009)

	OSRI Programs	EVOS Programs	Govern-mental Programs	Other Programs	Totals 2010	Totals 2009
Assets						
Current assets:						
Cash and cash equivalents	$ 67,254	-	-	-	67,254	109,412
Receivables:						
Government grants	-	133,485	60,233	-	193,718	229,184
Government service contracts	-	-	-	3,477	3,477	-
Other	-	-	-	59,311	59,311	4,800
Due from other funds	-	-	-	65,777	65,777	31,806
Total current assets	67,254	133,485	60,233	128,565	389,537	375,202
Investments	1,766,497	-	-	-	1,766,497	2,148,730
Total assets	$ 1,833,751	133,485	60,233	128,565	2,156,034	2,523,932
Liabilities and Net Assets						
Current liabilities:						
Deferred revenue	48,128	-	-	76,168	124,296	623,347
Current portion of long-term debt	-	-	-	11,645	11,645	-
Due to other funds	22,315	133,485	60,233	80,017	296,050	260,903
Total current liabilities	70,443	133,485	60,233	167,830	431,991	884,250
Long-term debt	-	-	-	107,437	107,437	-
Total liabilities	70,443	133,485	60,233	275,267	539,428	884,250
Net assets - unrestricted (deficit)	1,763,308	-	-	(146,702)	1,616,606	1,639,682
Total liabilities and net assets	$ 1,833,751	133,485	60,233	128,565	2,156,034	2,523,932

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities - All Program Funds
Year Ended September 30, 2010
(With Comparative Totals for 2009)

	OSRI Programs	EVOS Programs	Government Programs	Other Programs	Totals 2010	Totals 2009
Revenues:						
Grants, contracts and contributions:						
Government grants	$ 769,310	1,078,668	590,737	-	2,438,715	2,449,315
Government service contracts	-	-	-	64,545	64,545	18,061
Other	-	-	-	200,149	200,149	193,070
Total grants, contracts and contributions	769,310	1,078,668	590,737	264,694	2,703,409	2,660,446
Interest income	164	-	-	-	164	3,202
Investment income	123,463	-	-	-	123,463	67,195
Total revenues	892,937	1,078,668	590,737	264,694	2,827,036	2,730,843
Expenses:						
Salaries and benefits	287,726	539,450	137,640	124,803	1,089,619	1,029,342
Travel	36,525	17,305	6,286	17,798	77,914	68,924
Professional services	13,224	27,410	6,227	28,443	75,304	75,166
Subcontracts and charter costs	33,672	175,676	233,841	20,458	463,647	436,057
Supplies	5,136	33,957	38,619	46,907	124,619	48,582
Telephone	2,307	2,934	712	952	6,905	13,862
Network	2,666	7,780	1,570	4,061	16,077	-
Postage and freight	712	967	1,681	1,043	4,403	4,395
Printing, publications and copying	1,410	172	97	2,450	4,129	9,308
Facilities and rent expense	350	604	-	1,513	2,467	911
Utilities	8,000	834	258	58	9,150	8,651
Insurance	938	-	-	3,456	4,394	2,694
Equipment rental and maintenance	10,795	5,352	553	3,080	19,780	19,652
Advertising	-	-	-	1,680	1,680	823
Other	5,582	2,077	740	8,215	16,614	8,614
Grants awarded	295,005	-	-	-	295,005	338,532
Total expenses before interfund facility and equipment costs and indirect costs	704,048	814,518	428,224	264,917	2,211,707	2,065,513
Interfund research vessel costs (reimbursement)	-	34,000	32,500	(66,500)	-	-
Interfund facility and equipment costs	13,140	3,297	-	-	16,437	20,775
Indirect costs	43,841	222,626	102,407	31,356	400,230	330,104
Total expenses	761,029	1,074,441	563,131	229,773	2,628,374	2,416,392
Change in net assets	131,908	4,227	27,606	34,921	198,662	314,451
Net assets at beginning of year	1,639,682	-	-	-	1,639,682	1,569,287
Transfers to Plant Fund	(8,282)	(4,227)	(27,606)	(181,623)	(221,738)	(244,056)
Net assets (deficit) at end of year	$ 1,763,308	-	-	(146,702)	1,616,606	1,639,682

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Combining Schedule of Financial Position - Oil Spill Recovery Institute (OSRI) Programs
September 30, 2010
(With Comparative Totals for 2009)

	OSRI	Science of the Sound/ Forest to the Sea	Observational Oceanography	Model Valuation	PWSSC Fellowship	Balloon Demonstration	Totals 2010	Totals 2009
Assets								
Current assets - cash and cash equivalents	$ 67,254	-	-	-	-	-	67,254	109,412
Investments	1,766,497	-	-	-	-	-	1,766,497	2,148,730
Total assets	$ 1,833,751	-	-	-	-	-	1,833,751	2,258,142
Liabilities and Net Assets								
Current liabilities:								
Deferred revenue	48,128	-	-	-	-	-	48,128	591,541
Due to other funds	22,315	-	-	-	-	-	22,315	26,919
Total current liabilities	70,443	-	-	-	-	-	70,443	618,460
Net assets - unrestricted	1,763,308	-	-	-	-	-	1,763,308	1,639,682
Total liabilities and net assets	$ 1,833,751	-	-	-	-	-	1,833,751	2,258,142

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities – Oil Spill Recovery Institute (OSRI) Programs
Year Ended September 30, 2010
(With Comparative Totals for 2009)

	OSRI	Science of the Sound / Forest to the Sea	Observational Oceanography	Model Valuation	PWSSC Fellowship	Balloon Demonstration	Totals 2010	Totals 2009
Revenues:								
Grants, contracts and contributions - government grants	$ 563,019	48,000	97,513	11,042	44,245	5,491	769,310	1,050,375
Interest income	164	-	-	-	-	-	164	3,202
Investment income	123,463	-	-	-	-	-	123,463	67,195
Total revenues	686,646	48,000	97,513	11,042	44,245	5,491	892,937	1,120,772
Expenses:								
Salaries and benefits	202,869	30,040	39,715	7,799	7,303	-	287,726	380,306
Travel	24,652	2,718	3,352	-	5,803	-	36,525	42,779
Professional services	10,390	-	1,351	65	1,418	-	13,224	15,219
Subcontracts and charter costs	-	-	25,431	-	8,241	-	33,672	15,248
Supplies	413	1,405	1,034	742	1,395	147	5,136	17,490
Telephone	1,781	149	276	-	101	-	2,307	5,666
Network	1,403	259	996	8	-	-	2,666	-
Postage and freight	538	36	71	-	67	-	712	1,578
Printing, publications and copying	981	360	69	-	-	-	1,410	6,773
Facilities and rent expense	-	350	-	-	-	-	350	-
Utilities	8,000	-	-	-	-	-	8,000	8,000
Insurance	938	-	-	-	-	-	938	2,694
Equipment rental and maintenance	-	500	-	-	10,295	-	10,795	9,325
Advertising	-	-	-	-	-	-	-	17
Other	2,910	1,787	390	-	495	-	5,582	5,563
Grants awarded	295,005	-	-	-	-	-	295,005	338,532
Total expenses before interfund costs and indirect costs	549,880	37,604	72,685	8,614	35,118	147	704,048	849,190
Interfund facility and equipment costs	13,140	-	-	-	-	-	13,140	13,140
Indirect costs	-	10,396	21,846	2,428	9,127	44	43,841	67,708
Total expenses	563,020	48,000	94,531	11,042	44,245	191	761,029	930,038
Change in net assets	123,626	-	2,982	-	-	5,300	131,908	190,734
Net assets at beginning of year	1,639,682	-	-	-	-	-	1,639,682	1,569,287
Transfers to Plant Fund	-	-	(2,982)	-	-	(5,300)	(8,282)	(120,339)
Net assets at end of year	$ 1,763,308	-	-	-	-	-	1,763,308	1,639,682

PRINCE WILLIAM SOUND SCIENCE
AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Combining Schedule of Financial Position – Exxon Valdez Oil Spill Trustee Council (EVOS) Programs
September 30, 2010
(With Comparative Totals for 2009)

		Herring Logistics	Herring Ocean	Herring Thorne	Herring Forage	Herring Plankton	Seabird Predation	PWSH Predation	Totals	
									2010	2009
Assets										
Current assets - receivables - government grants	$	3,234	12,585	21,493	40,850	16,825	17,632	20,866	133,485	117,356
Liabilities and Net Assets										
Current liabilities - due to other funds		3,234	12,585	21,493	40,850	16,825	17,632	20,866	133,485	117,356
Net assets - unrestricted		-	-	-	-	-	-	-	-	-
Total liabilities and net assets	$	3,234	12,585	21,493	40,850	16,825	17,632	20,866	133,485	117,356

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities – Exxon Valdez Oil Spill Trustee Council (EVOS) Programs
Year Ended September 30, 2010
(With Comparative Totals for 2009)

	Herring Logistics	Herring Ocean	Herring Thorne	Herring Forage	Herring Plankton	Seabird Predation	PWSH Predation	Totals 2010	Totals 2009
Revenues - grants, contracts and contributions - government grants	$ 232,011	78,803	154,586	273,786	108,902	182,232	48,348	1,078,668	700,809
Expenses:									
Salaries and benefits	36,719	32,828	113,237	169,289	35,382	121,819	30,176	539,450	430,083
Travel	3,922	1,828	2,644	4,711	836	1,514	1,850	17,305	6,234
Professional services	-	450	-	20,091	-	6,869	-	27,410	22,461
Subcontracts and charter costs	144,256	14,192	5,066	-	2,094	10,068	-	175,676	67,185
Supplies	6,495	4,571	918	4,630	9,970	2,728	4,645	33,957	4,283
Telephone	-	-	555	831	434	976	138	2,934	5,797
Network	421	2,806	686	2,231	351	1,052	233	7,780	-
Postage and freight	-	284	-	325	5	130	223	967	1,096
Printing, publications and copying	27	-	100	-	7	38	-	172	1,382
Facilities and rent expense	-	-	-	-	-	604	-	604	604
Utilities	-	-	834	-	-	-	-	834	651
Equipment rental and maintenance	-	4,397	-	120	835	-	-	5,352	1,457
Advertising	-	-	-	-	-	-	-	-	57
Other	477	-	75	1,275	25	225	-	2,077	495
Total expenses before interfund costs and indirect costs	192,317	61,356	124,115	203,503	49,939	146,023	37,265	814,518	541,785
Interfund research vessel costs	-	-	-	-	34,000		-	34,000	-
Interfund facility and equipment costs	-	-	-	3,297	-		-	3,297	5,679
Indirect costs	39,694	17,447	30,471	62,759	24,963	36,209	11,083	222,626	153,345
Total expenses	232,011	78,803	154,586	269,559	108,902	182,232	48,348	1,074,441	700,809
Change in net assets	-	-	-	4,227	-	-	-	4,227	-
Net assets at beginning of year	-	-	-	-	-	-	-	-	-
Transfers to Plant Fund	-	-	-	(4,227)	-	-	-	(4,227)	-
Net assets at end of year	$ -	-	-	-	-	-	-	-	-

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)
Combining Schedule of Financial Position – Other Programs
Government Grants
September 30, 2010
(With Comparative Totals for 2009)

	Alaska OOS	Comm Ed NPRB	NPRB Bishop	ADF&G Surfbirds Bishop	NOPP Nutrient Sensor Campbell	USGS Climate Change Campbell	NASA Nutrient Flux Campbell	USFWS Caspian Tern	Totals 2010	Totals 2009
Assets										
Current assets - receivables - government grants	$ 31,153	5,149	1,295	5,514	2,475	7,044	7,568	35	60,233	111,828
Liabilities and Net Assets										
Current liabilities - due to other funds	31,153	5,149	1,295	5,514	2,475	7,044	7,568	35	60,233	111,828
Net assets - unrestricted	-	-	-	-	-	-	-	-	-	-
Total liabilities and net assets	$ 31,153	5,149	1,295	5,514	2,475	7,044	7,568	35	60,233	111,828

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities – Other Programs
Government Grants
Year Ended September 30, 2010
(With Comparative Totals for 2009)

	Alaska OOS	Comm Ed NPRB	NPRB Bishop	ADF&G Surfbirds Bishop	NOPP Nutrient Sensor Campbell	USGS Climate Change Campbell	NASA Nutrient Flux Campbell	USFWS Caspian Tern	Totals 2010	Totals 2009
Revenues - grants, contracts and contributions - government grants	$ 265,310	28,159	31,815	44,675	8,307	197,437	7,568	7,466	590,737	698,132
Expenses:										
Salaries and benefits	33,017	12,165	16,086	19,506	-	54,580	-	2,286	137,640	145,020
Travel	811	1,115	251	-	420	1,901	-	1,788	6,286	9,793
Professional services	-	-	450	-	-	5,777	-	-	6,227	11,101
Subcontracts and charter costs	164,756	7,040	6,412	14,427	-	34,127	5,833	1,246	233,841	330,750
Supplies	10,552	1,028	843	250	2,936	22,697	-	313	38,619	17,475
Telephone	219	207	-	-	42	244	-	-	712	1,629
Network	240	149	233	199	-	728	-	21	1,570	-
Postage and freight	387	-	67	40	35	1,152	-	-	1,681	707
Printing, publications and copying	23	-	-	12	-	62	-	-	97	71
Utilities	-	-	-	-	-	158	-	100	258	32
Equipment rental and maintenance	-	-	-	-	-	553	-	-	553	3,829
Other	-	-	180	-	-	560	-	-	740	1,202
Total expenses before interfund costs and indirect costs	210,005	21,704	24,522	34,434	3,433	122,539	5,833	5,754	428,224	521,609
Interfund research vessel costs	5,000	-	-	-	-	27,500	-	-	32,500	-
Interfund facility and equipment costs	-	-	-	-	-	-	-	-	-	-
Indirect costs	27,809	6,455	7,293	10,241	1,904	45,258	1,735	1,712	102,407	84,260
Total expenses	242,814	28,159	31,815	44,675	5,337	195,297	7,568	7,466	563,131	605,869
Change in net assets	22,496	-	-	-	2,970	2,140	-	-	27,606	92,263
Net assets at beginning of year	-	-	-	-	-	-	-	-	-	-
Transfers to Plant Fund	(22,496)	-	-	-	(2,970)	(2,140)	-	-	(27,606)	(92,263)
Net assets at end of year	$ -	-	-	-	-	-	-	-	-	-

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE

(d.b.a. Prince William Sound Science Center)

Combining Schedule of Financial Position – Other Programs

Non-Government Grants

September 30, 2010

(With Comparative Totals for 2009)

		CE/Science Camp/Ed/ Legacy Chilkat Sediment	CRWP Eyak Lake	Rasmussen Nutrient Winch	NFWF Monitor-ing	NFWF Bishop	Paul Allen Found-ation	POST Lingcod	R/V New Wave	Misc. Grants	Totals 2010	Totals 2009
Assets												
Current assets:												
Receivables:												
Government service contracts	$	-	3,477	-	-	-	-	-	-	-	3,477	-
Other		6,325	-	-	21,061	27,534	-	-	-	4,391	59,311	4,800
Due from other funds		24,312	-	-	-	-	37,277	3,579	-	609	65,777	31,806
Total current assets	$	30,637	3,477	-	21,061	27,534	37,277	3,579	-	5,000	128,565	36,606
Liabilities and Net Assets												
Current liabilities:												
Deferred revenue		30,312	-	-	-	-	37,277	3,579	-	5,000	76,168	31,806
Current portion of long-term debt		-	-	-	-	-	-	-	11,645	-	11,645	-
Due to other funds		325	3,477	-	21,061	27,534	-	-	27,620	-	80,017	4,800
Total current liabilities		30,637	3,477	-	21,061	27,534	37,277	3,579	39,265	5,000	167,830	36,606
Long-term debt		-	-	-	-	-	-	-	107,437	-	107,437	-
Total liabilities		30,637	3,477	-	21,061	27,534	37,277	3,579	146,702	5,000	275,267	36,606
Net assets - unrestricted (deficit)		-	-	-	-	-	-	-	(146,702)	-	(146,702)	-
Total liabilities and net assets	$	30,637	3,477	-	21,061	27,534	37,277	3,579	-	5,000	128,565	36,606

PRINCE WILLIAM SOUND SCIENCE AND TECHNOLOGY INSTITUTE
(d.b.a. Prince William Sound Science Center)
Combining Schedule of Activities - Other Programs
Non-Government Grants
Year Ended September 30, 2010
(With Comparative Totals for 2009)

	CE/Science Camp/Ed/ Legacy Chilkat Sediment	CRWP Eyak Lake	Rasmussen Nutrient Winch	NFWF Monitoring	NFWF Bishop	Paul Allen Found-ation	POST Lingcod	RV New Wave	Misc. Grants	Totals 2010	Totals 2009
Revenues - grants, contracts and contributions:											
Government service contracts	$ 19,430	39,537	-	-	-	-	-	-	5,578	64,545	18,061
Other	68,953	-	15,000	42,667	27,534	7,723	11,781	20,000	6,491	200,149	193,070
Total revenues	88,383	39,537	15,000	42,667	27,534	7,723	11,781	20,000	12,069	264,694	211,130
Expenses:											
Salaries and benefits	44,635	27,846	-	34,057	5,812	1,989	3,351	-	7,113	124,803	73,933
Travel	9,368	-	-	1,376	-	5,734	46	1,274	-	17,798	10,118
Professional services	4,904	-	-	4,995	-	-	138	18,406	-	28,443	26,385
Subcontracts and charter costs	-	-	-	-	17,464	-	2,434	-	560	20,458	22,874
Supplies	8,165	279	-	15	650	-	4,822	32,837	139	46,907	9,334
Telephone	733	-	-	219	-	-	-	-	-	952	-
Network	295	3,332	-	335	17	-	41	-	41	4,061	770
Postage and freight	934	-	-	-	-	-	18	91	-	1,043	1,014
Printing, publications and copying	2,433	-	-	-	-	-	17	-	-	2,450	1,082
Facilities and rent expense	200	-	-	-	-	-	-	1,313	-	1,513	275
Utilities	58	-	-	-	-	-	-	-	-	58	275
Insurance	101	-	-	-	-	-	-	3,355	-	3,456	275
Equipment rental and maintenance	-	-	-	572	-	-	-	2,508	-	3,080	5,041
Advertising	676	-	-	1,004	-	-	-	-	-	1,680	749
Other	1,326	-	-	94	-	-	-	6,795	-	8,215	1,354
Total expenses before interfund costs and indirect costs	73,828	31,457	-	42,667	23,943	7,723	10,867	66,579	7,853	264,917	152,929
Interfund research vessel costs (reimbursement)	-	-	-	-	-	-	-	(66,500)	-	(66,500)	-
Interfund facility and equipment costs	-	-	-	-	-	-	-	-	-	-	1,956
Indirect costs	14,555	8,080	-	-	3,591	-	914	-	4,216	31,356	24,791
Total expenses	88,383	39,537	-	42,667	27,534	7,723	11,781	79	12,069	229,773	179,676
Change in net assets	-	-	15,000	-	-	-	-	19,921	-	34,921	31,454
Net assets at beginning of year	-	-	-	-	-	-	-	-	-	-	-
Transfers to Plant Fund	-	-	(15,000)	-	-	-	-	(166,623)	-	(181,623)	(31,454)
Net assets (deficit) at end of year	$ -	-	-	-	-	-	-	(146,702)	-	(146,702)	-

Alaska Ocean Observing System
1007 W. Third Avenue, Suite 100
Anchorage, AK 99501
907.644.6703 – phone
907.644.6780 – fax
www.aoos.org

PRINCE WILLIAM SOUND SCIENCE CENTER
CORDOVA, ALASKA
P.O. Box 705 - Cordova, AK 99574
www.pwssc.org

June 1, 2011

Elise Hsieh, Executive Director
Exxon Valdez Oil Spill Trustee Council
441 W. 5th Ave., Suite 500
Anchorage, AK 99501

Dear Elise:

This letter, as well as a package of detailed project descriptions (DPDs) and budgets constitute our response to your April 27, 2011 and April 4, 2011 letters asking for additional information relating to our proposal for Long-Term Monitoring of Marine Conditions and injured Resources and Services Program.

1. *Seabird monitoring program – why do costs double in Year 3?* In our original proposal, we had hoped to include a winter survey in year 3, which is why costs were double. However, due to salary increases and the need to replace aging equipment, the principal investigators (PIs) say they are not able to include this additional survey in the current project without additional funding in the amount of $125k.

2. *Please provide a detailed breakdown of the items listed under "Coordination, Data Management, Outreach, and Administration" in the proposed budget.* This information is included in four separate components:

- Administration and Outreach budget and DPD submitted by PWSSC (Bird) for a total of $1,301k over five years. Funds are included for Science Center staff to provide these administrative functions and fiscal management at a cost of approximately $200k per year and includes contract management for six, non-Trustee agency sub-awards, meeting coordination and logistics, and administrative assistance in the formation and operation of the Scientific Review Panel and the Outreach Steering Committee. In addition, about $60k per year is included for outreach and community involvement activities that will be performed by our outreach partners as described in the DPD through small contracts or professional service agreements.
- Data Management budget and DPD submitted by AOOS (McCammon/Bochenek) for a total of $750k over five years. About $150k per year is included for the AOOS data team at Axiom Consulting to 1) provide basic data management services for the LTM project team; 2) provide access

to relevant historical data sets; 3) develop analytical and visualization tools for users; and 4) integrate all data, metadata and information products into the AOOS data management system for long term storage and public use.

- Science Coordination and Synthesis budget and DPD submitted by Kris Holderied, NOAA Kasitsna Bay Lab for $650k over five years to: 1) facilitate overall long-term monitoring program planning and information sharing among PIs, the herring program, EVOS TC staff, and other monitoring and research efforts in the region; 2) improve integration of monitoring information across scientific disciplines and regions; and 3) enhance communication of monitoring information to resource managers and the public through data synthesis reports and visualization tools.
- Conceptual Ecological Modeling budget and DPD submitted by Tuula Hollmen, Alaska SeaLife Center for $395k total over five years to develop conceptual models that summarize key components, processes, and functions of ecosystems in the EVOS-affected region and which support science synthesis, interactive data exploration and program planning.

3. *Please provide an explanation of how these proposals are integrated both within themselves and within the team.*

The long term monitoring (LTM) project is organized by four large components: environmental drivers, nearshore benthic ecosystems, pelagic monitoring, and lingering oil. These are all described in detail in Appendix 1 of the original proposal and in the Detailed Project Descriptions for each component. Our approach is to sustain key existing time series and to improve connections between and integration with existing monitoring programs. Integration will be achieved through these efforts:

- Use of an interdisciplinary framework that fosters collaboration among the LTM components and PIs;
- Required sharing of data among all PIs in a timely fashion in the LTM database;
- Annual PI meetings held in conjunction with the Herring Research Program PI meeting;
- Geographic scale (PWS, GOA shelf, Lower Cook Inlet) that improves linkages between monitoring in different regions of spill-affected region to better discern impacts of environmental change on restoration and continued recovery of injured resources;
- Close coordination with existing agency monitoring (e.g., National Park Service Vital Signs Monitoring Program, Kachemak Bay Research Reserve System-wide Monitoring Program, USFWS sea otter and bird surveys, NPRB GOAIERP, AOOS PWS and Cook Inlet observations;
- Use of program-wide science synthesis and conceptual ecological modeling efforts; and
- Support for publication of results.

The Environmental Drivers component examines physical oceanographic and lower trophic variability in the marine ecosystems of the northwest Gulf of Alaska, provides the environmental context under which the other components are conducted, and provides information essential for synthesizing the results from the other components into a conceptual ecosystem model. The Nearshore Benthic component is designed to include monitoring at four locations across the Gulf of Alaska and uses a combination of intensive sampling to detect larger spatial scale changes and extensive sampling to evaluate potential impacts from more localized sources. This component will be closely linked with the Lingering Oil component, as well as the Environmental Drivers component since the nearshore is strongly influenced by physical oceanographic processes. The Pelagic Monitoring component is a mixed species group that is critical to understanding long term effects of the spill on injured species, as well as the status and energy flow through the ecosystem by looking at top down apex predators and bottom up prey species. The Lingering Oil component examines 12 of the most heavily oiled shoreline sites to continue to track oil quantity and weathering, and resamples harlequin ducks and sea otters in western PWS to evaluate continuing exposure to lingering oil and the status of their recovery. Study results will be shared among all the LTM PIs.

4. *In light of strong concerns regarding the program's data component, the Council requires the proposers to work with Council staff to produce alternate options for Council to consider.*

We believe we have addressed this issue in several letters to the Trustee Council explaining our reasons for leveraging the investment of the Alaska Ocean Observing System in management of ocean and coastal biological, physical and chemical data. These bear repeating here:

- AOOS brings a significant level of leveraged resources, infrastructure, regional data management projects and partnerships to this proposed effort including the AOOS $500k a year commitment to a statewide system, a joint project with the AK Department of Fish and Game to make their data more easily available, a collaboration with the Prince William Sound Science Center/Oil Spill Recovery Institute for a data system to manage their projects, development of a Cook Inlet "ERMA-lite" project, and the USFWS Seabird Data System. The data management effort for the LTM and Herring programs could not be accomplished for the budgeted amount by a team without these leveraged resources. We believe it makes the most economic sense to take advantage of the AOOS data system in development and to leverage the proposed funding to help develop a robust, sustainable data management and delivery system for Gulf of Alaska coastal science and management needs, including the restoration and monitoring of EVOS-injured resources. Developing a parallel system, whether in or out of state, would not make effective use of the limited funds available. The AOOS data system is anticipated to be a long-term (essentially, permanent) commitment and funding for it is the top priority of the AOOS Board. National funding for the program is surviving in spite of budget cuts and changes in Congressional leadership. As data management is a core function of AOOS, it makes it an effective partner for the North Pacific Research Board efforts in the Gulf and proposed EVOS TC efforts.

- There are two immediate advantages of using an in-state entity for data management and delivery services for the LTM and Herring programs. First, since the majority of the PIs and program managers are in Alaska, it will facilitate coordination and communication, including in person meetings. The project PIs have significant expertise in data management and will be major contributors to the developing system. Second, the need for data management extends beyond development of a good database to include ongoing services. Ideally, both the datasets and an effective data service to provide ongoing information to managers, researchers and the general public, will be long-term legacies of these programs.

There appear to be three issues relating to the LTM data management capabilities:

1. The ability to manage a system that provides for data quality/accuracy (procedures to identify and minimize errors at each stage of the data lifecycle); security (data maintained to protect against loss); longevity (data documentation, proper storage conditions, backups, migration to current platforms, archiving); and availability/usability (making data available for decision-making, research, outreach and education). These are basic core functions of any data system.

AOOS has procedures in place for providing these core functions, guided by an external advisory committee (chaired by Dr. Phil Mundy, NOAA Auke Bay Lab director) consisting of 12 data experts from a variety of agencies and organizations, including NOAA, USGS, NSF, ADF&G, and GINA. The AOOS data system is designed to follow national interoperability standards. The current AOOS data team of Axiom was selected following a highly competitive and rigorous review process conducted by an external peer review team and led by Jeffrey Rosen, a nationally recognized data management expert now designing the data system for the Papahānaumokuākea Marine National Monument, the largest marine sanctuary in the world. The panel also included Jim Moore (National Center for Atmospheric Research) and Florence Fetterer (National Snow and Ice Data Center), Principal Investigator and co-PI for CADIS, the data information service for the National Science Foundation's Arctic Observing Network, as well as Jeff de LaBeaujardiere, who was just appointed as NOAA's chief data architect. Axiom was clearly superior to all other proposers. We would be happy to make the review team's report available to you.

The LTM management team, and AOOS, is confident that Axiom is capable of providing these core data management functions. If the Trustee Council or Council staff would like to make additions to the AOOS Data Management Advisory Committee, we would be happy to consider them. There are not many – if any - other entities that would be able to provide similar services (possibly the Geographic Information Network of Alaska at UAF or Resource Data, Inc., a private, for-profit company with an office in Alaska), and certainly none for the costs included in the LTM and Herring Projects. In fact, the funding provided in this proposal, even with the significant amount of leveraging made possible with the AOOS and other partnerships, is still minimally sufficient to provide core data management services given the desire to make accessible and use large amounts of historical data, most of which have no metadata and are currently not publicly accessible.

2. The ability to add value to the data through a system that allows for data integration, display, visualization, incorporation of a variety of biological, physical and chemical data into decision support tools and ecosystem models, etc.

The kinds of data products described here are challenging, but essential if we are to have a program that provides useful information to the research team, the EVOS Trustee Council, resource managers and the public. Again, the AOOS data team, as part of the national Integrated Ocean Observing System, is on the forefront in developing these kinds of applications. However, because they are “cutting edge”, we would welcome any additional support and collaborations from external entities such as the National Center for Ecological Analysis and Synthesis (NCEAS), Woods Hole Oceanographic Institution (WHOI) or any other organization that has experience in developing similar products. We should note, that because AOOS is part of IOOS, we have access to similar programs and expertise at the University of Washington, Scripps, Rutgers, University of Rhode Island, Boeing, SAIC, Applied Science Applications (ASA), and a host of other entities. Any participation by an external group would require additional funding, but, we believe, would ultimately add significant value to the overall LTM program.

3. Past performance of Axiom prior to its current contract with AOOS.

The herring portal final report has been submitted and the herring portal is now publicly available on the AOOS website. Axiom has successfully completed projects and currently supports data management systems for a variety of regional science programs including the Cook Inlet Regional Citizens Advisory Council, the Alaska Department of Fish and Game’s PWS herring monitoring program, the US Fish and Wildlife Service seabird monitoring group, LGL Alaska, the Alaska Native Heritage Program, and the PWSSC/OSRI. We can provide letters of reference from these entities if requested. AOOS administrative staff has complete confidence in their data management team. If the Trustee Council does not wish the AOOS data team to be part of this proposal, we need to know this immediately. It is not a simple matter of AOOS or the team subcontracting the data management component to another data contractor. The result of removing the AOOS data management team would be complete removal of AOOS from the entire project, including McCammon as the project lead, with significant impacts on the Herring Research Program proposal. The remainder of the team would then have to decide separately on a new team lead and data management structure.

We would also like to respond to additional recommendations made to the Team:

1. *Routine inclusion of the NOAA small mesh trawl survey data done off of Kodiak into the LTM database so that the information can be used for possible future analyses that may be used to infer climate change impacts to the GOA ecosystem.*

Our response: We concur, and intend to collaborate with ongoing efforts by the NOAA National Marine Fisheries Service (NMFS) and the Alaska Department of Fish and Game (ADF&G) to integrate their multiple databases for time series of small-mesh trawl surveys in the Gulf of Alaska. We will include linkages to any integrated databases that are developed as a part of that effort in the LTM database and investigate whether a direct integration of database efforts would be cost-effective for all organizations.

2. *Use of an open source data system, which plans for inclusion of structurally diverse data and is compliant with currently acceptable metadata standards for biological data. Development of a plan for incorporating this data into NPRB's GOAIERP program at the end of the first five-year contract cycle.*

Our response: We concur. AOOS has in place an open source data system with capacity for including structurally diverse data and use of currently acceptable metadata standards for biological data. We envision NPRB GOAIERP incorporating their data into the AOOS system since that project will conclude before the EVOS project does. We intend to closely coordinate these two major initiatives.

3. *Incorporate current forage fish aerial surveys from NOAA, ADF&G and USFWS into the project design. The forage fish component is vague in terms of measurement.*

Our response: We concur. Information from previous EVOSTC-funded forage fish projects, such as the aerial survey work by Evelyn Brown, and vessel based surveys by Lew Haldorson, Ken Coyle, John Thedinga, Jeep Rice and others will be incorporated into the forage fish monitoring project design. We will also seek out and incorporate unpublished information for non-target species (e.g., eulachon, capelin) in bycatch data from NOAA RACE surveys, and work conducted at the Prince William Sound Science Center (e.g., Thorne *et al*., Bishop *et al*.), University of Alaska (e.g. Iverson *et al*., Brown *et al*. currently Flying Fish Ltd., Norcross *et al*.), and ADF&G (Moffitt *et al*., Byerly *et al*.). Please see the Piatt and Arimitsu DPD for additional information on how this will be done, as well as for more detail on how the forage fish surveys will be conducted.

4. *Include a conceptual model that will be a critical part of the three-year science review.*

Our response: We concur. The conceptual ecological modeling component is a significant part of our LTM program and one goal of this effort is to support ongoing evaluation of the effectiveness of the monitoring program, including at the three-year science review. As described further in the modeling component DPD, we anticipate that multiple conceptual models may be developed through coordination with the project PIs.

5. *Encourage Dan Esler to make sure Dan Rosenberg's ADF&G HADU survey data is incorporated into the LTM database and project design.*

Our response: Dr. Esler is aware of the ADF&G survey data and used that information to designate sampling sites for the original CYP1A monitoring work, which the proposed studies will replicate. Also, a proposal to formally and spatially integrate those datasets (along with estimates of residual oil) has been submitted as part of separate Lingering Oil proposals to the EVOSTC (led by Zach Nixon and Jacqui Michel).

6. *Incorporate acoustic tracking monitoring lines in real time, using boats already in the area to increase the frequency of data collection. Use Hinchinbrook entrance as a demonstration site for real time data recovery.*

Our response: We request additional clarification on this comment. If this references the humpback whale monitoring work proposed by Moran and Straley, they propose to identify prey using sonar, rather than track whales via use of acoustic tags. If this references the POST acoustic arrays planned for Hinchinbrook and Montague entrances, we plan to coordinate this project conducted by the PWSSC with the LTM project.

We hope this adequately answers the questions posted to the LTM team. We'd be happy to provide any additional information as requested.

Sincerely,

Molly McCammon

Molly McCammon, Executive Director
Alaska Ocean Observing System

Nancy A Bird

Nancy Bird, President and C.E.O.
Prince William Sound Science Center

Kris Holderied

Kris Holderied, Science Lead, Long Term Monitoring Proposal
NOAA Kasitsna Bay Laboratory

Cc: Dr. Scott PegauScience Lead, PWS Herring Monitoring Proposal
Research Program Manager, Oil Spill Recovery Institute

Catherine Boerner, EVOS Trustee Council Science Coordinator

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term Monitoring: Benthic Monitoring Component **–** Nearshore benthic systems in the Gulf of Alaska

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Brenda Ballachey, USGS Alaska Science Center; Thomas Dean, Coastal Resources Associates, Inc.

Study Location: Gulf of Alaska

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et al. in 2011. This component focuses on resources within the nearshore ecosystem. The primary objective is to continue recovery and restoration monitoring in nearshore areas in the Gulf of Alaska, including study areas within Prince William Sound, Kenai Fjords, Katmai, and Kachemak Bay, following the plan initially developed in Restoration Project 050750 and tested in Restoration Project 070750. We will evaluate the current status of EVOS injured resources and services (recreational, subsistence, and passive use) to determine when populations may be considered recovered, and to foster recovery of those resources by identifying and recommending actions in response to any factors that may be limiting recovery. The USGS, National Park Service and the University of Alaska Fairbanks are partnering to accomplish these goals. Information collected will include data sets that have been used previously to assess recovery of injured resources in Prince William Sound (e.g., population abundance and survival of sea otters, abundance estimates for mussels, clams, and other intertidal organisms). Contrasts among trends in injured resources across study areas, including both oiled and unoiled areas, will provide the primary means of resource evaluation. Our purpose is to implement a nearshore monitoring program that is comparable at multiple locations across the Gulf of Alaska. The nearshore sampling in Prince William Sound, in conjunction with sampling of other areas, will provide the foundation of a comprehensive restoration nearshore monitoring program for the entire oil spill area and form an integral part of the larger Long-Term Monitoring project.

Estimated Budget:
EVOSTC Funding Requested: including the 9% GA

2012	2013	2014	2015	2016	5-yr total
$282.4K	$304.1K	$331.9K	$309.6K	$331.9K	$1,559.9K

Non-EVOSTC Funds to be used:

2012	2013	2014	2015	2016	5-yr total
$25.0	$73	$73	$73	$73	$317

Date: May 31, 2011

PROJECT PLAN

I. NEED FOR THE PROJECT
A. Statement of Problem

Introduction:

The nearshore is considered an important component of the Gulf of Alaska ecosystem, including the region affected by the *Exxon Valdez* oil spill (EVOS), because it provides:

- A variety of unique habitats for resident organisms (e.g. sea otters, harbor seals, shorebirds, seabirds, nearshore fishes, kelps, seagrasses, clams, mussels, and sea stars).
- Nursery grounds for marine animals from other habitats (e.g. crabs, salmon, herring, and seabirds).
- Feeding grounds for important consumers, including killer whales, harbor seals, sea otters, sea lions, sea ducks, shore birds and many fish and shellfish.
- A source of animals important to commercial and subsistence harvests (e.g. marine mammals, fishes, crabs, mussels, clams, chitons, and octopus).
- An important site of recreational activities including fishing, boating, camping, and nature viewing.
- A source of primary production for export to adjacent habitats (primarily by kelps, other seaweeds, and eelgrass).
- An important triple interface between air, land and sea that provides linkages for transfer of water, nutrients, and species between watersheds and offshore habitats.

Also, the nearshore is broadly recognized as highly susceptible and sensitive to both natural and human disturbances on a variety of temporal and spatial scales. For example, observed changes in nearshore systems have been attributed to such diverse causes as global climate change (e.g. Barry et al. 1995, Sagarin et al. 1999), oil spills (e.g. Dahlmann et al. 1994 Peterson et al. 2001, 2003), human disturbance and removals (e.g. Shiel and Taylor 1999, Murray et al. 1999), and influences of invasive species (e.g. Jamieson et al. 1998). Nearshore systems are especially good indicators of change because organisms in the nearshore are relatively sedentary, accessible, and manipulable (e.g. Dayton 1971, Sousa 1979, Peterson 1993, Lewis 1996). Also, in contrast to other marine habitats, there is a comparatively thorough understanding of mechanistic links between species and their physical environment (e.g. Connell 1972, Paine 1977, 1994, Estes and Duggins 1995) that facilitates understanding causes for change.

Perhaps most important with respect to the goals of the proposed Long-Term Monitoring program, the nearshore is the one habitat within which it is most likely that we will be able to detect relatively localized sources of change, tease apart human-induced from natural changes, and provide suggestions for policies to reduce human impacts. Because many of the organisms in the nearshore are sessile or have relatively limited home ranges, they can be geographically linked to sources of change with a reasonable degree of accuracy.

Finally, the nearshore is critically important because it was without doubt the habitat most impacted by the 1989 EVOS, and as of 2002, was known to be a persistent repository for oil that could be linked to continued injury to species that reside there (especially, sea otters, and harlequin ducks; Peterson et al. 2003, Short et al. 2004). In addition, the majority of the species or services currently listed by the EVOS Trustee Council as either "not recovered" or "status of recovery unknown" reside in or are associated with the nearshore. Thus, monitoring within the nearshore system provides the opportunity to continue to assess progress toward recovery, and to hasten that recovery by identifying and ameliorating other human induced disturbances.

Following several years of planning, a restoration and ecosystem monitoring plan for the nearshore marine ecosystems affected by the EVOS in the Gulf of Alaska (GOA) was completed (Dean and Bodkin 2006). Within this plan it was recognized that (1) restoration of resources injured by the spill will benefit from information on the status and trends of those resources on a variety of spatial scales within the Gulf, and (2) causes of changes independent of the oil spill are likely to occur in the GOA during the 21st century, and are likely to result from a number of different agents (e.g. normal environmental drivers, global climate change, shoreline development and associated inputs of pollutants). Further, in order to effect restoration of injured resources it is essential to separate EVOS-related effects from other sources of change. It was also recognized that changes are likely to occur over varying temporal and spatial scales. For example, global climate change may result in a gradual change in the nearshore community that occurs over decades and has impacts over the entire GOA. On the other hand, impacts from shoreline development will likely be more episodic and more local. Thus, one challenge of designing a monitoring program was to detect changes occurring over widely varying scales of space and time, and from various causes. To this end, a conceptual framework for monitoring was designed with the following elements:

1) Synoptic sampling of specified physical and biological parameters (e.g. shoreline geomorphology and eelgrass cover) over the entire GOA.

2) Sampling of a variety of specified biological and physical parameters (e.g. abundance and growth of intertidal organisms, abundance of selected birds and marine mammals) within a few specified areas spread throughout the GOA; these are referred to as intensive sites. The focus is on species injured by the EVOS, in particular species not recovered or whose status relative to recovery is uncertain.

3) Sampling of a smaller suite of selected biological and physical parameters (e.g. the abundance, growth, and contaminant levels in mussels and clams) at a larger number of less intensively studied sites stretching across the GOA. These are referred to as extensive sites.

4) Conduct of shorter-term studies aimed at identifying important processes regulating or causing changes within a given system or subsystem.

Intensive sampling was designed to detect larger spatial scale changes while extensive sampling was aimed at evaluating potential impacts from more localized sources, and especially those resulting from human activities. Process studies were to focus on determining causes for observed changes.

The monitoring plan developed for the EVOSTC was revised and adopted by the National Park Service's Vital Signs Long-Term Monitoring Plan, and implemented in Katmai NP in 2006 and in Kenai Fjords NP in 2007. In 2010, we (EVOS Project 10100750; Bodkin and Dean) were funded through the EVOSTC to implement the long-term nearshore monitoring plan in western Prince William Sound (PWS), providing for monitoring of the nearshore environment, sea otters, nearshore sea birds (including black oystercatchers), and intertidal kelps, seagrasses and invertebrates.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services", submitted by McCammon et al. in spring 2011.

II. PROJECT DESIGN

A. Objectives

Project Concept:

We now propose to continue a long-term restoration and ecosystem monitoring program at four locations across the GOA. Most of the effort to be funded by the EVOSTC program is concentrated on PWS, but we plan to integrate with existing monitoring efforts to cost-effectively monitor other areas of the spill affected region and provide better information for recovery and restoration of injured resources. The proposed sampling design follows that initially put forward in 2006, and modified in 2010. It consists of four primary sampling locations in nearshore habitats in the central GOA region between Katmai and PWS (Figure 1) and includes four regions, PWS, Kenai and Katmai National Parks, and Kachemak Bay. Within PWS, we propose to (1) continue sampling the western block on an annual basis through 2016 (western PWS was already sampled in 2007 and 2010, with planned sampling in 2011 and 2012 under EVOS Project 10100750), and (2) add locations in eastern and northern PWS, to be sampled biennially through 2016. We also propose to implement the monitoring program in Kachemak Bay, an area that already has been the focus of long-term intertidal monitoring (this sub-component will be led by B. Konar and K. Iken, UAF), and where existing monitoring protocols will be adapted to be consistent with those used in the other study areas, providing comparable data. Monitoring includes physical measurements, kelps and sea grasses, marine invertebrates, birds, and mammals, with a focus on species that were injured as a result of the EVOS. In addition to taxa specific resources, monitoring includes recognized important ecological relations that include well described predator-prey relations, measures of nearshore ecosystem productivity, and stable isotope and contaminant analyses. The benthic monitoring program will also rely on physical data collected in PWS, along the GOA shelf and in Cook Inlet, under the Environmental Drivers component of the proposed long-term monitoring program.

Locations (see Figure 1)**:**

Western PWS (5 intensive sites): This study area is already funded by EVOSTC (Project 10100750), covering data collection during 2010-2012. We are requesting funds to continue monitoring the study sites long-term, including 2013–2016.

Eastern and Northern PWS: These study areas were initially proposed as part of the long-term monitoring plan developed for PWS in 2006; however, they have not been incorporated into the ongoing study. We request funds to initiate sampling at 5 sites in each area (northern and eastern PWS), to be sampled alternate years, starting in 2012.

Katmai and Kenai National Parks (5 intensive sites each park): These study areas have been funded primarily by NPS, with data collection at Katmai ongoing since 2006, and at Kenai ongoing since 2007. We request funding for support of sea otter aerial surveys at both areas (alternate years each location), for the charter vessel to Katmai for annual sampling, and for support of personnel who will be involved in data collection and management across all study locations, 2012-2016.

Kachemak Bay (5 intensive sites): Monitoring of intertidal invertebrates and algae in nearshore areas of Kachemak Bay has been ongoing for over a decade, along with extensive sea otter studies shellfish surveys, and oceanographic measurements. Intertidal survey methods have followed slightly different protocols from those used in the other proposed nearshore study areas. We request funds to support the implementation of sampling protocols that will be consistent with other areas, 2012-2016.

Objectives:

1. Continue restoration monitoring in the nearshore in order to evaluate the current status of injured resources in oiled areas.

2. Identify if those injured resources being monitored may be considered recovered from EVOS effects.

3. Identify potential factors that could inhibit recovery of injured resources, and recommend potential restoration actions.

B. Procedural and Scientific Methods

Tasks:

The projected schedule of tasks for the nearshore benthic component is outlined in Table 1.

1. Collection of sea otter skulls for determination of age-at-death.

Surveys will be conducted in PWS in April of each year to collect sea otter carcasses for determination of age-at-death to be used in describing annual survival. In Katmai and Kenai, surveys for carcasses will be conducted opportunistically during the June/July field work. In Kachemak Bay, a coalition of the Center for Alaska Coastal Studies, the Homer Marine Mammal Stranding Network, and the USFWS have been and will continue to conduct systematic beach walks to recover dead birds, sea otters, and marine debris.

2. Annual collection of sea otter diet data.
Data will be obtained through direct observation of foraging sea otters using high powered spotting scopes and a stratified random sampling design.

3. Aerial surveys of sea otter abundance.
Estimates of sea otter abundance (variance) and distribution will be obtained through detection corrected standardized aerial surveys using a stratified random sampling design.

4. Sampling of intertidal invertebrates and algae.
Estimates of the abundance and sizes of intertidal algae and invertebrates will be obtained from annual sampling along permanent transects and quadrats (5 sites per block, with both a rocky and a soft sediment transect at each site) using a stratified random sampling design. Sampling will include mussel collection for stable isotope analyses.

5. Sampling of sea grasses and subtidal kelps.
Estimates of seagrass and canopy-forming kelp abundance will be obtained through at sea surveys conducted in close proximity to each of the 5 sites per block.

6. Diet and productivity of black oystercatchers.
Black oystercatcher nests on transects associated with each of the intensive sites will be monitored annually in June/July for productivity, and shell litter will be collected to determine diet (prey items and sizes). Note: we will explore the potential for partnering with the USFS on black oystercatcher work already ongoing in PWS.

C. Data Analysis and Statistical Methods

Standard operating procedures (SOP's) for all data collection have been fully developed as part of the preparation and implementation of nearshore monitoring in Katmai NP, Kenai NP, and western PWS. The *Nearshore Restoration and Ecosystem Monitoring Program* (Dean and Bodkin 2006) and the *National Park Service SWAN Nearshore Monitoring Program* (Dean and Bodkin 2011) include protocols that provide justification, background, objectives, goals, an overview of the monitoring and sample design, the fundamental analytical approach, and description of operational requirements. The SOP's provide the details of each data collection procedure, their relations to one another, and how they can be integrated to provide understanding of causes of change that will be detected.

Data analyses and statistical methods used to evaluate changes in the nearshore environment are detailed in Dean and Bodkin (2006) and Dean et al. (2008). In general we will examine trends in each metric over time within each location, differences between locations over time, and interactions between time and locations (i.e., the extent to which changes within each location track changes across locations over time) through regression and information-theoretic (IT) criteria (Burnham and Anderson 2002, 2004). Competing hypotheses (models) will be selected a priori and those models will be ranked based on their relative support (AIC values). These analyses will help to sort out effects of small scale sources of change (e.g., effects of oil in PWS or other location specific impacts such as logging activities) from larger scale sources of change (e.g., those due to climate change that are occurring over the entire GOA).

Project Logistics
Task 1 will be accomplished in PWS by a 6 d research cruise in April of each year, and in Katmai and Kenai NPs during the June/July field trips. Tasks 2, 4, and 5 will be accomplished during a single 9-10 d cruise in June/July of each year. Task 3 will be accomplished by single engine aircraft during the summer months. Task 6 will be accomplished through additional samplings in 2012 & 2013 (harlequin ducks already being sampled in 2011). Work will be coordinated and integrated with the NPS Southwest Alaska Network (SWAN) long-term nearshore monitoring at Kenai Fjords and Katmai National Parks.

D. Description of Study Area

See "Locations" above, and Figure 1.

E. Coordination and Collaboration with Other Efforts

Study Team:

This study is a component of the larger Long-Term Monitoring project, proposed to the EVOSTC in spring 2011 (McCammon et al. 2011). The team of scientists working on the nearshore monitoring component have an extensive background of research efforts in coastal marine areas of Alaska. B. Ballachey and T. Dean have both been Principal Investigators on previous EVOS studies, with a primary focus on PWS studies, since 1989, and currently are conducting the monitoring of nearshore areas in PWS. T. Dean has been central in development and implementation of both the NPS and the USGS/EVOS nearshore monitoring programs. M. Shephard of the NPS is in charge of the long-term monitoring program in the Kenai and Katmai parks; H. Coletti has worked in the GOA since 2000, and has been dedicated to the NPS nearshore monitoring program since 2008. B. Konar and K. Iken both have extensive experience working in various coastal areas of Alaska, and are currently conducting the nearshore monitoring in Kachemak Bay. Overall project management will be the responsibility of Ballachey, Dean, Coletti, Konar and Iken. We anticipate that Dean, Ballachey and Coletti, with support from J. Bodkin, M. Lindeberg, K. Kloecker, M. Shephard and additional USGS and NPS scientific staff, will continue the data collection and sampling (all components) in PWS, Kenai and Katmai, and that B. Konar and K. Iken will have responsibility for the Kachemak Bay site, with support from A. Doroff for sea otter foraging observations and additional support from the USFWS for sea otter surveys and carcass collections. Further, we anticipate a team approach to the overall field work effort, with shared personnel across areas wherever possible, to ensure consistency of data collection and enhance our understanding of comparisons and contrasts across areas. We will attend an annual meeting of the larger group of scientists involved in the overall EVOS LTM project, but also expect that we will continue to work closely together as a sub-group and to meet less formally as required throughout each year.

Linkages:

A primary goal of the proposed monitoring effort is to evaluate the recovery status of resources in PWS that were injured by the EVOS. Our ability to assess the restoration of resources injured by the spill will benefit from information on the status and trends of those resources on a variety of spatial scales within the Gulf. We will continue evaluation of EVOS injured resources and services (recreational, subsistence, and passive use), to determine when populations may be considered recovered, and where applicable, to foster recovery of those resources by identifying and recommending actions in response to factors limiting recovery. The NPS program for nearshore monitoring along the Katmai, Kenai Fjords, and Lake Clark National Park coasts was initiated in 2006, and has been collecting information similar to the data sets that have been used to assess recovery of injured resources in PWS (e.g., population abundance and survival of sea otters, population abundance of harlequin ducks and other nearshore birds, abundance estimates for mussels, clams, and other intertidal organisms). The addition of the study area in Kachmak Bay (where monitoring has been ongoing for approximately a decade, although methods have varied from those used in PWS) will further enhance our ability to assess recovery. Contrasts among trends in injured resources in and outside Prince William Sound, including both oiled and unoiled areas, will provide the primary means of resource evaluation. We will also integrate data on injured resources collected as part of this effort with data on (1) locations of persistent EVOS oil along shorelines, and (2) biomarker expression in harlequin ducks and sea otters as an indicator of continuing exposure to residual oil, anticipated as part of the Lingering Oil component which is closely related to this project (See Ballachey, Esler et al. 2011 DPD).

Sea otters are a focus species for restoration monitoring, as the population in western PWS was severely impacted by the EVOS, and in areas where shorelines were most heavily oiled, sea otters had not recovered to pre-spill abundance as of 2008, although there were indications that recovery may be underway (Bodkin et al. 2002, Monson et al. 2000). Data to be collected as part of the proposed monitoring will contribute to existing long-term data sets from WPWS and other regions, including survey data on sea otter abundance since 1993, carcass data on sea otter ages at death, since 1976, and sea otter foraging data since the mid-1970s.

As productivity in the nearshore is strongly influenced by physical oceanographic processes, it will be a priority to evaluate whether or not changes that may be noted in the nearshore systems are reflected in either oceanographic conditions or in synchronous changes in pelagic species and conditions. The geographic scale of our study (GOA-wide) will provide greater ability to discern both potential linkages across these diverse components, as well as among the study areas within the nearshore, allowing us to evaluate relations and changes in the nearshore resources. We will incorporate data on annual and seasonal patterns measured in the Environmental Drivers component of the overall study as well as data from the Pelagic study components. One component of the overall LTM of particular importance to the nearshore is surveys of nearshore marine birds, which will be accomplished in PWS through the Marine Bird Population Trends monitoring component (representing a further long-term data set; see Irons et al. 2000) and at Kenai Fjords and Katmai by the NPS SWAN program.

III. SCHEDULE

A. Project Milestones

Objective 1. Continue restoration monitoring in the nearshore in order to evaluate the current status of injured resources in oiled areas.

To be done annually, each spring/summer from 2012 – 2016.

Objective 2. Identify if those injured resources being monitored may be considered recovered from EVOS effects.

Major report to be provided by December 31, 2015 incorporating findings through 2015; will coordinate with Lingering Oil project to look at recovery status of harlequin ducks and sea otters (2012).

Objective 3. Identify potential factors that could inhibit recovery of injured resources, and recommend potential restoration actions.

Major report to be provided by December 31, 2015, incorporating findings through 2015.

Table 1. Components of the proposed nearshore benthic monitoring plan and five year schedule.

COMPONENT	2012	2013	2014	2015	2016
Western PWS, intertidal invertebrates and algae	x	x	x	x	x
Western PWS, kelps and sea grass	x	x	x	x	x
Western PWS, black oystercatchers	x	x	x	x	x
Western PWS, contaminants	x				
Western PWS, sea otter carcass recovery	x	x	x	x	x
Western PWS, sea otter foraging observations	x	x	x	x	x
Eastern PWS, intertidal invertebrates and algae	x		x		x
Eastern PWS, kelps and sea grass	x		x		x
Northern PWS, intertidal invertebrates and algae		x		x	
Northern PWS, kelps and sea grass		x		x	
Katmai NP, intertidal invertebrates and algae	x	x	x	x	x
Katmai NP, kelps and sea grass	x	x	x	x	x
Katmai NP, black oystercatchers	x	x	x	x	x
Katmai NP, sea otter carcass recovery	x	x	x	x	x
Katmai NP, sea otter foraging observations	x	x	x	x	x
Kenai NP, intertidal invertebrates and algae	x	x	x	x	x
Kenai NP, kelps and sea grass	x	x	x	x	x
Kenai NP, black oystercatchers	x	x	x	x	x
Kenai NP, sea otter carcass recovery	x	x	x	x	x
Kenai NP, sea otter foraging observations	x	x	x	x	x
Kachemak Bay, intertidal invertebrates and algae	x	x	x	x	x
Kachemak Bay, sea otter carcass recovery	x	x	x	x	x
Kachemak Bay, sea otter foraging observations	x	x	x	x	x
PWS, sea otter aerial survey	x		x		x
Kenai NP, sea otter aerial survey		x		x	
Katmai NP, sea otter aerial survey	x		x		x
Kachemak Bay, sea otter aerial survey	x		x		x
PWS Nearshore marine bird survey (under Pelagic component)	x		x		x
Katmai nearshore marine bird survey	x	x	x	x	x
Kenai nearshore marine bird survey	x	x	x	x	x
Stable isotope analysis of mussels (5 areas/yr)	x	x	x	x	x

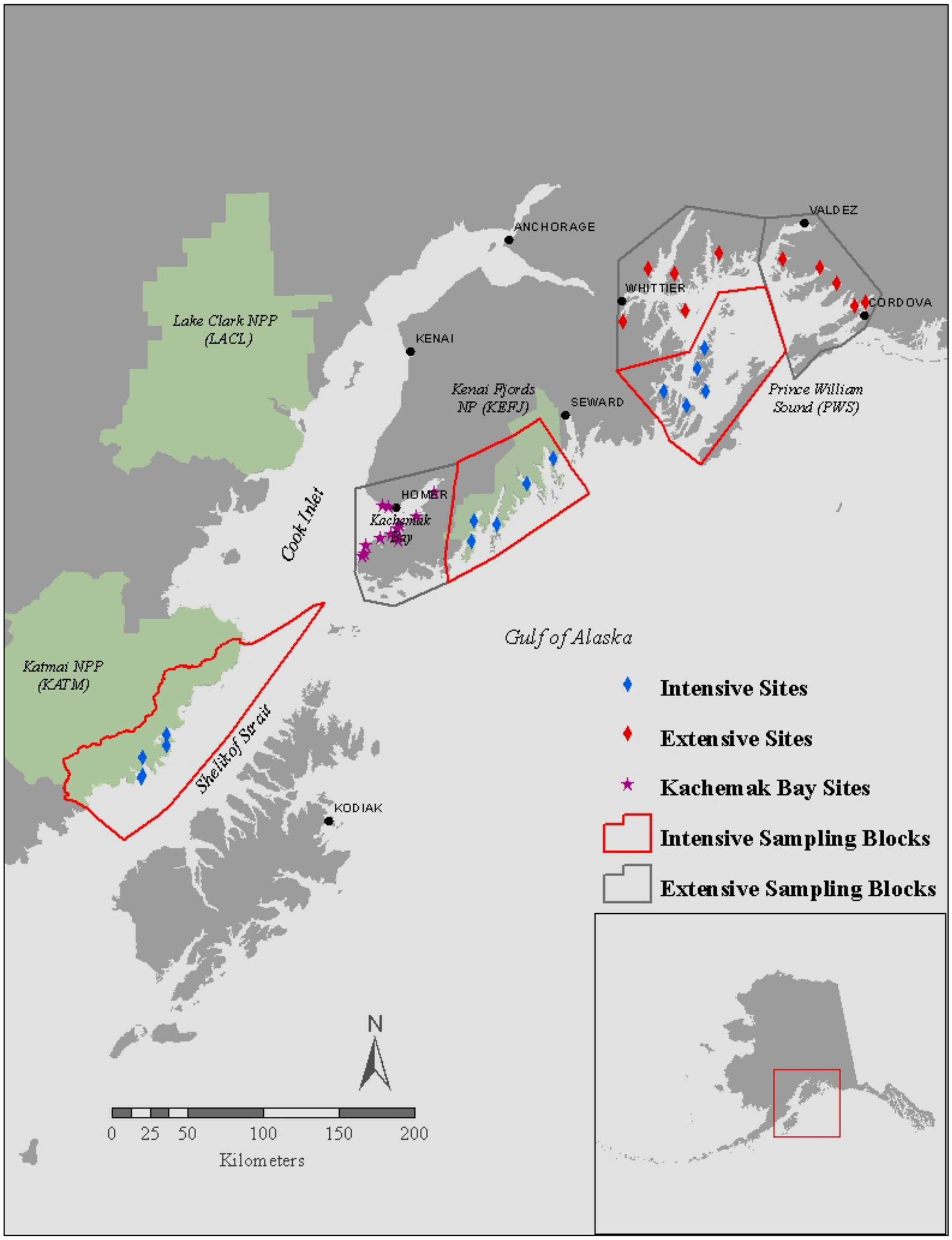


Figure 1. Sites currently part of (Katmai, Kenai, and WPWS; USGS/EVOSTC and NPS) and proposed (Kachemak Bay, NPWS, and EPWS) for long-term monitoring (LTM) under the LTM nearshore benthic component. Sites at Kachemak Bay/Kasitsna Bay have been monitored long-term (UAF) and will comprise an additional intensive block in the LTM nearshore benthic component; specific sites within the block to be included will be determined prior to 2012.

B. Measurable Project Tasks

FFY 11, 2nd 3rd and 4th quarters (January 1, 2011-September 30, 2011)
Project reviewed by Trustee Council; funding approved; DPD's finalized

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)
Initiate planning for field work; hiring of additional staff
Annual meeting of PI's for LTM project; Anchorage

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)
Annual Marine Science Symposium, Anchorage, January; preparation for seasonal field work

FFY 12, 3rd & 4th quarters (April 1, 2012-September 30, 2012)
Field work in PWS, Kachemak Bay, Katmai NP, Kenai Fjords NP. See Table 1.
Submit Annual Report to EVOSTC Council Office.

FFY 13 – 16
Similar schedule for meetings and field work as in FFY 12; see Table 1.

FFY 16, 1st quarter (October 1, 2011-December 31, 2011)
Submit major report on first 4 years of monitoring

Five Year Goals:
At the end of the first five years of studies, we plan to answer a number of questions, including: Are there changes in the nearshore communities monitored in our study? Are any observed changes in the nearshore synchronous across the GOA? Are changes reflected in concurrent changes in oceanographic or pelagic conditions? Have injured resources in the nearshore recovered from the spill? If not, are there other factors (non-spill related) constraining their recovery?

Data synthesis within the nearshore group, and sharing, integration and synthesis across the larger Long-term Monitoring group, will be a priority. This process will be advanced to a great extent by annual meetings of the project scientists. By the 4th year, we plan to have completed a power analysis to optimize sampling (this analysis will be initiated in 2011, using data collected over five years from the Katmai NP study area). We will identify those metrics showing greatest variation among areas or change over time, and consider the development of process studies as appropriate to understand the causes of variation.

We will make a concerted effort to participate in outreach activities, to disseminate our key findings to a greater group of stakeholders with interest in the GOA study areas.

References:
See ***Appendix 2: References for Long-Term Monitoring***, submitted Spring 2011 by McCammon et al.

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$110.0	$160.0	$160.0	$160.0	$160.0	$750.0
Travel	$3.5	$5.0	$5.0	$5.0	$5.0	$23.5
Contractual	$118.5	$103.0	$125.0	$103.0	$125.0	$574.5
Commodities	$5.1	$9.0	$9.0	$9.0	$9.0	$41.1
Equipment	$22.0	$2.0	$5.5	$7.0	$5.5	$42.0
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$259.1	$279.0	$304.5	$284.0	$304.5	$1,431.1
General Administration (9% of subtotal)	$23.3	$25.1	$27.4	$25.6	$27.4	$128.8
PROJECT TOTAL	$282.4	$304.1	$331.9	$309.6	$331.9	$1,559.9
Other Resources (Cost Share Funds)	$20,000.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In-kind contributions will be for the staff time, primarily from NPS (approximately 2 months of a GS 12), but also from USFWS and USGS, to gather and provide the data to the contractor as well as provide expertise as to ecosystem processes and provide assistance in the compilation and reporting of results.

FY12-16

Program Title:
Team Leader:

SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)						
SUBTOTAL	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
General Administration (9% of subtotal)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
PROJECT TOTAL	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In this box, identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

FY12-16

Program Title:
Team Leader:

FORM 3A
NON-TRUSTEE
AGENCY SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs: Name	Project Title	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY12

Program Title:
Team Leader:

FORM 3B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY12

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs: Name	Project Title	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY13

Program Title:
Team Leader:

FORM 3B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY13

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY14

Program Title:
Team Leader:

FORM 3B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY14

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY15

Program Title:
Team Leader:

FORM 3B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY15

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY16

Program Title:
Team Leader:

FORM 3B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY16	**Program Title:** **Team Leader:**	**FORM 3B** **CONTRACTUAL &** **COMMODITIES DETAIL**

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$110.0	$160.0	$160.0	$160.0	$160.0	$750.0
Travel	$3.5	$5.0	$5.0	$5.0	$5.0	$23.5
Contractual	$118.5	$103.0	$125.0	$103.0	$125.0	$574.5
Commodities	$5.1	$9.0	$9.0	$9.0	$9.0	$41.1
Equipment	$22.0	$2.0	$5.5	$7.0	$5.5	$42.0
SUBTOTAL	$259.1	$279.0	$304.5	$284.0	$304.5	$1,431.1
General Administration (9% of subtotal)	$23.3	$25.1	$27.4	$25.6	$27.4	$128.8
PROJECT TOTAL	$282.4	$304.1	$331.9	$309.6	$331.9	$1,559.90
All amounts are in thousands of dollars.						
Other Resources (Cost Share Funds)	$25.0	$73.0	$73.0	$73.0	$73.0	$317.0

COMMENTS: Annual in-kind contributions from USGS consist of staff time (J. Bodkin, K. Kloecker, G. Esslinger, G. Snedgen: $50K), reduced costs for charter vessel time ($23K), significant use of USGS equipment such as inflatables/outboards, GPSs, spotting scopes, field laptops, sounding equipment (eelgrass sampling).

FY12-16

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4A
TRUSTEE AGENCY
SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs: Name	Project Title	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
NOAA staff		1.0	10.0		10.0
Senior scientist, Ballachey		1.5	10.0		15.0
Field Leader		6.0	7.5		45.0
Biotech		8.0	5.0		40.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	32.5	0.0	
				Personnel Total	$110.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
Field travel					1.5
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.5

FY12

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Vessel charter: PWS, $1.5/day * 9 days	13.5
Vessel charter: Katmai	20.0
Aerial Survey (sea otters) in Katmai/Kenai (alternating years)	17.5
Contaminant analyses, PWS mussels, 15 sites * 2.5/site	37.5
Stable Isotope analyses, PWS mussels	6.0
Coastal Resource Associates (CRA, Dr. Tom Dean)	24.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$118.5

Commodities Costs: Description	Commodities Sum
fuel for skiffs	1.0
field & safety gear	1.5
software	2.6
Commodities Total	$5.1

FY12	**Program Title: Nearshore Monitoring** **Team Leader: Ballachey & Dean** **Agency: USGS**	**FORM 4B** **CONTRACTUAL &** **COMMODITIES DETAIL**

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
data logging instruments (HOBOs, Star-Oddis, etc)	5.0	2.0	10.0
field computers (toughbooks or equivalent)	2.0	3.5	7.0
skiff/outboard for use on charters	1.0	5.0	5.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$22.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Questar spotting scopes & high-power binocs for sea otter forage data collection	3	USGS
Existing small skiffs for charters (3 skiffs/nearshore trip are needed, more if trips are concurrent)	2	USGS
Field computers	3	USGS
Cameras	2	USGS
GPS units	3	USGS
25 ft Boston Whaler, if needed for carcass surveys, monitoring work	1	USGS
airplane GPS unit for sea otter surveys	1	USGS

FY12

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs: Name	Project Title	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
Senior scientist, Ballachey		2.0	10.0		20.0
Field Leader		12.0	7.5		90.0
Biotech		8.0	5.0		40.0
NOAA staff		1.0	10.0		10.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	32.5	0.0	
				Personnel Total	$160.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
Field travel					3.0
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.0

FY13

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Vessel charter: PWS, $1.0/day * 23 days	23.0
Vessel charter: Katmai	20.0
Aerial Survey (sea otters) in Katmai/Kenai (alternating years)	17.5
Sea otter carcass tooth cementum age analysis	0.5
Stable Isotope analyses, PWS mussels	6.0
Coastal Resource Associates (CRA, Dr. Tom Dean)	36.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$103.0

Commodities Costs: Description	Commodities Sum
fuel for skiffs	3.0
field & safety gear	3.0
software	3.0
Commodities Total	$9.0

FY13

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
data logging instruments (HOBOs, Star-Oddis, etc)	1.0	2.0	2.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$2.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Questar spotting scopes & high-power binocs for sea otter forage data collection	3	USGS
Existing small skiffs for charters (3 skiffs/nearshore trip are needed, more if trips are concurrent)	2	USGS
Field computers	3	USGS
Cameras	2	USGS
GPS units	3	USGS
25 ft Boston Whaler, if needed for carcass surveys, monitoring work	1	USGS
airplane GPS unit for sea otter surveys	1	USGS

FY13

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Senior scientist, Ballachey		2.0	10.0		20.0
Field Leader		12.0	7.5		90.0
Biotech		8.0	5.0		40.0
NOAA staff		1.0	10.0		10.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	32.5	0.0	
				Personnel Total	$160.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Field travel					3.0
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.0

FY14

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Vessel charter: PWS, $1.0/day * 23 days	23.0
Vessel charter: Katmai	20.0
Aerial Survey (sea otters) in Katmai/Kenai (alternating years)	17.5
Sea otter carcass tooth cementum age analysis	0.5
Stable Isotope analyses, PWS mussels	6.0
Coastal Resource Associates (CRA, Dr. Tom Dean)	36.0
Aerial Survey (sea otters) in PWS	22.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$125.0

Commodities Costs: Description	Commodities Sum
fuel for skiffs	3.0
field & safety gear	3.0
software	3.0
Commodities Total	$9.0

FY14

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
data logging instruments (HOBOs, Star-Oddis, etc)	1.0	2.0	2.0
field computers (toughbooks or equivalent)	1.0	3.5	3.5
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$5.5

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Questar spotting scopes & high-power binocs for sea otter forage data collection	3	USGS
Existing small skiffs for charters (3 skiffs/nearshore trip are needed, more if trips are concurrent)	2	USGS
Field computers	3	USGS
Cameras	2	USGS
GPS units	3	USGS
25 ft Boston Whaler, if needed for carcass surveys, monitoring work	1	USGS
airplane GPS unit for sea otter surveys	1	USGS

FY14

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Senior scientist, Ballachey		2.0	10.0		20.0
Field Leader		12.0	7.5		90.0
Biotech		8.0	5.0		40.0
NOAA staff		1.0	10.0		10.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	32.5	0.0	
				Personnel Total	$160.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Field travel					3.0
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.0

FY15

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Vessel charter: PWS, $1.0/day * 23 days	23.0
Vessel charter: Katmai	20.0
Aerial Survey (sea otters) in Katmai/Kenai (alternating years)	17.5
Sea otter carcass tooth cementum age analysis	0.5
Stable Isotope analyses, PWS mussels	6.0
Coastal Resource Associates (CRA, Dr. Tom Dean)	36.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$103.0

Commodities Costs: Description	Commodities Sum
fuel for skiffs	3.0
field & safety gear	3.0
software	3.0
Commodities Total	$9.0

FY15

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
data logging instruments (HOBOs, Star-Oddis, etc)	1.0	2.0	2.0
skiff/outboard for use on charters	1.0	5.0	5.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$7.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Questar spotting scopes & high-power binocs for sea otter forage data collection	3	USGS
Existing small skiffs for charters (3 skiffs/nearshore trip are needed, more if trips are concurrent)	2	USGS
Field computers	3	USGS
Cameras	2	USGS
GPS units	3	USGS
25 ft Boston Whaler, if needed for carcass surveys, monitoring work	1	USGS
airplane GPS unit for sea otter surveys	1	USGS

FY15

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Senior scientist, Ballachey		2.0	10.0		20.0
Field Leader		12.0	7.5		90.0
Biotech		8.0	5.0		40.0
NOAA staff		1.0	10.0		10.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	32.5	0.0	
				Personnel Total	$160.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Field travel					3.0
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.0

FY16

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Vessel charter: PWS, $1.0/day * 23 days	23.0
Vessel charter: Katmai	20.0
Aerial Survey (sea otters) in Katmai/Kenai (alternating years)	17.5
Sea otter carcass tooth cementum age analysis	0.5
Stable Isotope analyses, PWS mussels	6.0
Coastal Resource Associates (CRA, Dr. Tom Dean)	36.0
Aerial Survey (sea otters) in PWS	22.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$125.0

Commodities Costs: Description	Commodities Sum
fuel for skiffs	3.0
field & safety gear	3.0
software	3.0
Commodities Total	$9.0

FY16

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
data logging instruments (HOBOs, Star-Oddis, etc)	1.0	2.0	2.0
field computers (toughbooks or equivalent)	1.0	3.5	3.5
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$5.5

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Questar spotting scopes & high-power binocs for sea otter forage data collection	3	USGS
Existing small skiffs for charters (3 skiffs/nearshore trip are needed, more if trips are concurrent)	2	USGS
Field computers	3	USGS
Cameras	2	USGS
GPS units	3	USGS
25 ft Boston Whaler, if needed for carcass surveys, monitoring work	1	USGS
airplane GPS unit for sea otter surveys	1	USGS

FY16

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
chief scientist, Dr. Dean		2.0	11.0		22.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	11.0	0.0	
				Personnel Total	$22.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$2.0

FY12

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B
CONTRACTOR
PERSONNEL &

Agency: CRA (Dr. Tom Dean)

TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY12

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B CONTRACTOR CONTRACTUAL &

Agency: CRA (Dr. Tom Dean)

COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B
CONTRACTOR
EQUIPMENT DETAIL

Agency: CRA (Dr. Tom Dean)

EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
chief scientist, Dr. Dean		3.0	11.0		33.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	11.0	0.0	
				Personnel Total	$33.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Field travel					1.0
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.0

FY13

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B
CONTRACTOR
PERSONNEL &

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

Agency: CRA (Dr. Tom Dean)

COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B CONTRACTOR EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Agency: CRA (Dr. Tom Dean)

EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
chief scientist, Dr. Dean		3.0	11.0		33.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	11.0	0.0	
				Personnel Total	$33.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Field travel					1.0
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.0

FY14

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B
CONTRACTOR
PERSONNEL &

Agency: CRA (Dr. Tom Dean)

TRAVEL DETAIL

Contractual Costs: Description		Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$0.0

Commodities Costs: Description		Commodities Sum
	Commodities Total	$0.0

Agency: CRA (Dr. Tom Dean)

COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B
CONTRACTOR
EQUIPMENT DETAIL

Agency: CRA (Dr. Tom Dean)

EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
chief scientist, Dr. Dean		3.0	11.0		33.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	11.0	0.0	
				Personnel Total	$33.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Field travel					1.0
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.0

FY15

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B
CONTRACTOR
PERSONNEL &

Agency: CRA (Dr. Tom Dean)

TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY15

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B
CONTRACTOR
CONTRACTUAL &

Agency: CRA (Dr. Tom Dean)

COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B CONTRACTOR EQUIPMENT DETAIL

Agency: CRA (Dr. Tom Dean)

EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
chief scientist, Dr. Dean		3.0	11.0		33.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	11.0	0.0	
				Personnel Total	$33.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Field travel					1.0
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.0

FY16

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B
CONTRACTOR
PERSONNEL &

Agency: CRA (Dr. Tom Dean)

TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

Agency: CRA (Dr. Tom Dean)

COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: CRA (Dr. Tom Dean)

FORM 4B CONTRACTOR EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Agency: CRA (Dr. Tom Dean)

EQUIPMENT DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term Monitoring: Lingering Oil - Evaluating Chronic Exposure of Harlequin Ducks and Sea Otters to Lingering *Exxon Valdez* Oil in Western Prince William Sound

Project Period: October 1, 2011 – March 31, 2013

Primary Investigator(s): Brenda Ballachey, US Geological Survey; Daniel Esler, Simon Fraser University and Pacific Wildlife Foundation
Co-Investigators: James Bodkin, Liz Bowen, Keith Miles, US Geological Survey.

Study Location: Prince William Sound, Alaska

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et al. in spring 2011. Sea otter and sea duck populations in PWS were injured as a result of the *Exxon Valdez* oil spill, with evidence for both immediate acute mortality and longer term injury from chronic exposure to oil spilled in 1989. For both species, it appears that full recovery is not yet complete. Prior EVOSTC projects have examined continuing exposure to lingering oil as a factor constraining recovery, using biomarker assays (the cytochrome P4501A biomarker, CYP1A, to evaluate oil exposure in harlequins, and gene expression assays to evaluate exposure and health of sea otters). Harlequin ducks have continued to show elevation of CYP1A in oiled areas through 2009, suggesting exposure is still a concern; harlequin populations were resampled in spring 2011 and results of CYP1A assays on those samples are pending. For sea otters, recent studies have shown that abundance in the vicinity of northern Knight Island has not yet returned to pre-spill levels, and that otters are foraging in areas where lingering oil persists in sediments. Most recently, gene expression assays have been developed, using an array of genes to specifically quantify oil exposure and health status of sea otters. We propose to resample harlequin and sea otter populations in western PWS in 2012 to assess biomarker levels, as a continued effort to measure exposure of these nearshore residents to lingering oil and monitor the status of their recovery as injured species, and as indicators of recovery of the overall nearshore ecosystem.

Estimated Budget:
EVOSTC Funding Requested: 2012: $204.2;
(breakdown by fiscal year and must include 9% GA)

Non-EVOSTC Funds to be used: 2012: $70.0; *(breakdown by fiscal year)*

Date: May 31, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT
A. Statement of Problem

Sea otter and sea duck populations in western PWS were injured as a result of the *Exxon Valdez* oil spill, with evidence for both immediate acute mortality and longer term injury from chronic exposure to oil spilled in 1989. A series of EVOSTC projects have addressed population demographic endpoints including abundance, habitat use, and survival rates, as well as biological sampling to monitor ongoing exposure to lingering EVO using biomarker assays (the cytochrome P4501A biomarker to evaluate oil exposure in harlequins and gene expression assays to evaluate exposure and health of sea otters).

For both sea otters and harlequin ducks, the most recent data suggest recovery is not yet complete. As part of EVOSTC Restoration Project 070808 (Nearshore Synthesis: Sea otters and sea ducks), harlequin ducks were examined for lingering exposure to residual *Exxon Valdez* oil. This work determined that harlequin ducks continued to show biomarker evidence of elevation of cytochrome P4501A in oiled areas through 2009, which was interpreted to indicate exposure to *Exxon Valdez* oil up to 20 years after the spill (Esler et al. 2010). For sea otters, recent studies (also part of Restoration Project 070808) have shown that sea otters in the vicinity of northern Knight Island have not yet returned to pre-spill abundance, and that they are foraging in intertidal areas where lingering oil persists in sediments (USGS unpublished data). Most recently, gene expression assays for sea otters have been developed, using an array of genes to specifically quantify oil exposure and health status of sea otters (Restoration Project 090841); that effort is close to final.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities
Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," submitted by McCammon et al. in spring 2011.

II. PROJECT DESIGN
A. Objectives

<u>Project Concept</u>
In this study, we propose to resample harlequin ducks and sea otters in PWS for biomarker assays to evaluate recovery status of these species by measuring the degree of continued exposure to lingering oil, health and condition. Harlequin ducks were sampling in March 2011 (EVOS Restoration Project 11100808). If the 2011 results show no significant difference between oiled and unoiled areas in expression of CYP1A, then we request funding to resample harlequins in 2012 to confirm that exposure has ceased. Alternatively, if we see a continued difference between areas in the 2011 sampling, then we request that the next sampling of harlequin ducks be deferred until 2013, to continue the schedule of sampling every 2 years since 2005. Sea otters were last sampled in 2008, and we request funding to resample in 2012.

Objective 1. Harlequin duck sampling in oiled and unoiled areas of PWS, for CYP1A analyses, to evaluate continuing exposure to lingering oil of ducks captured in oiled areas.

Objective 2. Sea otter sampling in oiled and unoiled areas of PWS, for gene expression assay, to evaluate continuing exposure and health of sea otters captured in oiled areas.

B. Procedural and Scientific Methods

Harlequin ducks: Methods will replicate those from previous work (Trust et al. 2000, Esler et al. 2010) to facilitate comparisons. In brief, we will capture harlequin ducks in several areas that were oiled during the *Exxon Valdez* oil spill, including Bay of Isles, Herring Bay, Crafton Island, Lower Passage, and Green Island, as well as at nearby unoiled northwestern Montague Island. In each area, 20 harlequin ducks will have small (< 0.5g) liver biopsies taken while under general anesthesia. Biopsies will be frozen in liquid nitrogen immediately and will be maintained in a frozen state until laboratory analysis at UC Davis by co-PI Keith Miles (and collaborators Jack Henderson and Barry Wilson). CYP1A induction will be determined by measuring hepatic 7-ethoxyresorufin-*O*-deethylase (EROD) activity, which is a catalytic function principally of hydrocarbon-inducible CYP1A enzymes.

Sea otters: Methods will replicate those used in 2008 (EVOSTC Project 090841). Sea otters will be captured in areas that were heavily oiled during the 1989 EVOS (primarily in Bay of Isles, Lower Passage and Herring Bay), and at nearby Montague Island to provide a reference sample from an unoiled area (15 per area). In addition, we will capture otters (n=15) in eastern PWS, to provide a second reference sample. Sea otters will be sedated and blood collected from the jugular vein into Paxgene tubes, and tubes shipped to UC Davis for gene expression assays by co-PIs L. Bowen and K. Miles. A panel of 12 genes will be quantified, including genes identified in ongoing sea otter studies as showing variation across oiled and unoiled areas within PWS, following the methods and data analytical approach currently being developed by Bowen and Miles (USGS unpublished data).

C. Data Analysis and Statistical Methods

For harlequin ducks, data analysis will follow that of Esler et al. (2010) and will evaluate average differences in EROD between oiled and unoiled areas, accounting for any effects of age, sex, or mass. Further, the latest data will be compared with results from previous years to assess whether or not a temporal trend is apparent, which may clarify the process of recovery. For sea otters, data on a panel of 12 genes will be analyzed by multivariate methods currently being developed by Miles and Bowen as part of EVOSTC Project 090841, and being applied to samples collected in 2006 and 2008. The sea otter data collected in 2012 also will be compared with previous years sampling to assess temporal trends that may be present.

D. Description of Study Area

This project will focus on harlequin ducks and sea otters in western PWS. Capture of harlequins will target birds in Bay of Isles, Herring Bay, Crafton Island, Lower Passage, and Green Island (all areas that were oiled in 1989), and at nearby unoiled northwestern Montague Island to provide a reference sample. Sea otters will be caught in areas around northern Knight Island, primarily in Bay of Isles, Lower Passage and Herring Bay, and at nearby Montague Island to provide an unoiled reference sample. In addition, we will capture otters in eastern PWS, to provide a second reference sample.

E. Coordination and Collaboration with Other Efforts

This project is coordinated with the proposed Long-Term Monitoring study submitted to the EVOSTC in spring 2011 by McCammon et al. A primary goal of the proposed monitoring effort is to evaluate the recovery status of resources in PWS that were injured by the EVOS, and measuring biochemical indices of exposure in harlequin ducks and sea otters, two species recognized to have protracted recovery from the spill, directly supports that goal. This project will continue the biomarker studies that were initiated in 1996 in western PWS, supported by the EVOSTC. Methods used will conform to those from earlier studies (for harlequins, back to 1996; for sea otters, new methodologies were applied in 2006). The project will coordinate with and complement studies concurrently proposed by NOAA ABL to continue tracking oil levels in intertidal sediments.

III. SCHEDULE

A. Project Milestones

Objective 1. Harlequin duck sampling in oiled and unoiled areas of PWS, for CYP1A analyses, to evaluate continuing exposure to lingering oil of ducks captured in oiled areas.
To be met by March 31, 2013, assuming captures go ahead in 2012. Otherwise, if captures are deferred until 2013, to be met by March 31, 2014. Schedule for captures will depend on 2011 results, pending.

Objective 2. Sea otter sampling in oiled and unoiled areas of PWS, for gene expression assay, to evaluate continuing exposure and health of sea otters captured in oiled areas.
To be met by March 31, 2013, assuming captures go ahead in spring 2012 (anticipated schedule).

Measurable Project Tasks

FFY 11, 2nd quarter (January 1, 2011-March 31, 2011)
Project funding approved by Trustee Council

FFY 11, 3rd quarter & 4th quarter (April 1, 2011-September 30, 2011)
Finalize proposals and budgets

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)
Planning for spring captures (harlequins and sea otters)
Potential meeting of LTM PI's, Anchorage

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)
January: Annual Marine Science Symposium, Anchorage
March: Harlequin duck capture, PWS

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)
May: Sea otter capture, PWS
Sample analyses, harlequins

FFY 12, 4th quarter (July 1, 2012-September 30, 2012)
Sample analyses, sea otters
Data analysis, harlequins

FFY 13, 1st quarter (October 1, 2012-December 31, 2012)
Complete sample and data analyses, initiate reports
Potential meeting of LTM PI's, Anchorage

FFY 1, 2nd quarter (January 1, 2013-March 31, 2013)
Complete reports, submit to EVOSTC
January: Annual Marine Science Symposium, Anchorage

Note: *the above schedule assumes that captures of harlequins and sea otters will be done in 2012 and not deferred until 2013.*

References:

Esler, D., K.A. Trust, B.E. Ballachey, S.A. Iverson , T.L. Lewis, D.J. Rizzolo, D.M. Mulcahy, A.K. Miles, B.R. Woodin, J.J. Stegeman, J.D. Henderson, and B.W. Wilson. 2010. Cytochrome P4501A biomarker indication of oil exposure in harlequin ducks up to 20 years after the Exxon Valdez oil spill. Environmental Toxicology and Chemistry 29:1138-1145.

Trust, K.A., D. Esler, B.R. Woodin, and J.J. Stegeman. 2000. Cytochrome P450 1A induction in sea ducks inhabiting nearshore areas of Prince William Sound, Alaska. Marine Pollution Bulletin 40:397-403.

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$10.0	$0.0	$0.0	$0.0	$0.0	$10.0
Contractual	$141.9	$0.0	$0.0	$0.0	$0.0	$141.9
Commodities	$35.5	$0.0	$0.0	$0.0	$0.0	$35.5
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
SUBTOTAL	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
General Administration (9% of subtotal)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
PROJECT TOTAL	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Other Resources (Cost Share Funds)		$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: NOTE!!!! One year of capture/sampling is planned for harlequin ducks (HADU) and one year for sea otters (SEOT). HADU capture year depends on sample analysis currently in progress, so work will be conducted in 2012 OR in 2013. We're adding values to this budget worksheet for only 1 year (2012), but work might end up being conducted in a different year (2013). SEOT capture dates are not anticipated to vary from planned. Cost Share Funds include (a) USGS staff for sea otter capture logistics, capture, sample prep and shipping, and data analysis: approximately 70K; (b) USGS equipment for sea otter captures, and (c) USGS laboratory facilities for EROD and gene expression analyses. Donated funds include the sea otter veterinarian's time (travel and supplies will be covered under this project).

FY12-16

Program Title: HADU & SEOT Lingering Oil
Team Leader: Esler & Ballachey
Agency: USGS

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0				$0.0
Travel	$10.0	$0.0				$10.0
Contractual	$141.9	$0.0				$141.9
Commodities	$35.5	$0.0				$35.5
Equipment	$0.0	$0.0				$0.0
SUBTOTAL	$187.4	$0.0	$0.0	$0.0	$0.0	$187.4
General Administration (9% of subtotal)	$16.9	$0.0	$0.0	$0.0	$0.0	$16.9
PROJECT TOTAL	$204.2	$0.0	$0.0	$0.0	$0.0	$204.2
All amounts are in thousands of dollars.						
Other Resources (Cost Share Funds)	$70.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: NOTE!!!! One year of capture/sampling is planned for harlequin ducks (HADU) and one year for sea otters (SEOT). HADU capture year depends on sample analysis currently in progress, so work will be conducted in 2012 OR in 2013. We're adding values to this budget worksheet for only 1 year (2012), but work might end up being conducted in a different year (2013). SEOT capture dates are not anticipated to vary from planned. Cost Share Funds include (a) USGS staff for sea otter capture logistics, capture, sample prep and shipping, and data analysis: approximately 70K; (b) USGS equipment for sea otter captures, and (c) USGS laboratory facilities for EROD and gene expression analyses. Donated funds include the sea otter veterinarian's time (travel and supplies will be covered under this project).

FY12-16

Program Title: HADU & SEOT Lingering Oil
Team Leader: Esler & Ballachey
Agency: USGS

FORM 4A
TRUSTEE AGENCY SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
		Subtotal	0.0	0.0	
				Personnel Total	0.00

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
SEOT: lingering oil: Seattle to Whittier, 2 people	1.0	2	42	0.1	4.10
SEOT: lingering oil: Anchorage to Whittier, 4 people	0.0	4	84	0.0	1.26
SEOT: lingering oil: San Jose to Whittier, 1 person	2.0	1	21	0.1	3.05
SEOT: lingering oil: misc travel costs (GOV fuel, tunnel tickets, parking)					1.60
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
				Travel Total	10.01

FY12

Program Title: HADU & SEOT Lingering Oil
Team Leader: Esler & Ballachey
Agency: USGS

FORM 4B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
HADU: lingering oil: PWLF, see forms 4A & 4B at very end of this document	93.87
SEOT: lingering oil: vessel charter for SEOT capture, 21 d * 2.0/day	42.00
SEOT: lingering oil: tooth cementum analysis	1.00
SEOT: lingering oil: serum chemistry analysis	3.00
SEOT: lingering oil: blood hematology analysis	2.00
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	141.87

Commodities Costs: Description	Commodities Sum
HADU: lingering oil, EROD supplies and analysis, 40 samples * $0.2/sample	8.00
SEOT: lingering oil: field sampling supplies, veterinary supplies (incl sedation & reversal agents)	10.00
SEOT: lingering oil: sample shipping	2.00
SEOT: lingering oil: gene expression analysis, 45 samples * 0.3/sample	13.50
SEOT: lingering oil: gene expression supplies	1.00
SEOT: lingering oil: gene expression equipment calibration	1.00
Commodities Total	35.50

FY12

Program Title: HADU & SEOT Lingering Oil
Team Leader: Esler & Ballachey
Agency: USGS

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
		New Equipment Total	0.00

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
SEOT: Lingering Oil: 25 ft Boston Whaler for sea otter capture		USGS
SEOT: Lingering Oil: assorted inflatable skiffs for sea otter capture		USGS
SEOT: Lingering Oil: diver rebreather units and/or tangle nets for sea otter capture		USGS
SEOT: Lingering Oil: Questar spotting scopes & binoculars & Garmin GPS units for sea otter capture		USGS
HADU: lingering oil: EROD analytical equipment		USGS

FY12

Program Title: HADU & SEOT Lingering Oil
Team Leader: Esler & Ballachey
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs: Name	Project Title	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
		Subtotal	0.0	0.0	
				Personnel Total	0.00

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
				Travel Total	0.00

FY13

Program Title: HADU & SEOT Lingering Oil
Team Leader: Esler & Ballachey
Agency: USGS

FORM 4B
PERSONNEL & TRAVEL
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
	0.00
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	0.00

Commodities Costs: Description	Commodities Sum
Commodities Total	0.00

FY13

Program Title: HADU & SEOT Lingering Oil
Team Leader: Esler & Ballachey
Agency: USGS

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
		New Equipment Total	0.00

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: HADU & SEOT Lingering Oil
Team Leader: Esler & Ballachey
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Dr. Dan Esler	HADU: lingering oil	3.0	8.0		24.00
lead technician	HADU: lingering oil	1.0	3.0		3.00
bio-tech (2)	HADU: lingering oil	4.0	2.0		8.00
veterinarian	HADU: lingering oil				10.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
		Subtotal	13.0	0.0	
				Personnel Total	45.00

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Vancouver to Anchorage	1.0	5	100	0.0	7.40
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
				Travel Total	7.40

FY12

Program Title: HADU & SEOT Lingering Oil Team
Leader: Esler & Ballachey
Agency: Pacific Wildlife Foundation (Dr. Esler)

FORM 4B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
HADU: lingering oil: PWLF overhead 5%	4.47
HADU: lingering oil: vessel charter, 14 days * 2.0/day	28.00
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	32.47

Commodities Costs: Description	Commodities Sum
HADU: lingering oil: field sampling supplies, veterinary supplies, & liquid nitrogen	7.00
HADU: lingering oil: sample shipping	2.00
Commodities Total	9.00

FY12

Program Title: HADU & SEOT Lingering Oil Team
Leader: Esler & Ballachey
Agency: Pacific Wildlife Foundation (Dr. Esler)

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
		New Equipment Total	0.00

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: HADU & SEOT Lingering Oil Team
Leader: Esler & Ballachey
Agency: Pacific Wildlife Foundation (Dr. Esler)

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
		Subtotal	0.0	0.0	
				Personnel Total	0.00

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
				Travel Total	0.00

FY13

Program Title: HADU & SEOT Lingering Oil Team
Leader: Esler & Ballachey
Agency: Pacific Wildlife Foundation (Dr. Esler)

FORM 4B
PERSONNEL & TRAVEL
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	0.00

Commodities Costs: Description	Commodities Sum
Commodities Total	0.00

FY13

Program Title: HADU & SEOT Lingering Oil Team
Leader: Esler & Ballachey
Agency: Pacific Wildlife Foundation (Dr. Esler)

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
			0.00
		New Equipment Total	0.00

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: HADU & SEOT Lingering Oil Team
Leader: Esler & Ballachey
Agency: Pacific Wildlife Foundation (Dr. Esler)

FORM 4B
EQUIPMENT DETAIL

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long term monitoring: Environmental drivers component - Long-term Monitoring of zooplankton populations on the Alaskan Shelf and Gulf of Alaska using Continuous Plankton Recorders.

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Sonia Batten soba@sahfos.ac.uk and Alex Bychkov (bychkov@pices.int)

Study Location: Shelf waters SW of PWS, Cook Inlet, northern Gulf of Alaska

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al. Many important species, including herring, forage outside of Prince William Sound for at least some of their life history (salmon, birds and marine mammals for example) so an understanding of the productivity of these shelf and offshore areas is important to understanding and predicting fluctuations in resource abundance. The Continuous Plankton Recorder (CPR) has sampled a continuous transect extending from the inner part of Cook Inlet, onto the open continental shelf and across the shelf break into the open Gulf of Alaska monthly through spring and summer since 2004. There are also data from 2000-2003 from a previous transect. The current transect intersects with the outer part of the Seward Line and provides complementary large scale data to compare with the more local, finer scale plankton sampling on the shelf and in PWS. We propose to continue sampling this transect through 2016. Resulting data will enable us to identify where the incidences of high or low plankton are, which components of the community are influenced, and whether the whole region is responding in a similar way to meteorological variability. Evidence from CPR sampling over the past decade suggests that the regions are not synchronous in their response to ocean climate forcing. The data can also be used to try to explain how the interannual variation in ocean food sources creates interannual variability in PWS zooplankton, and when changes in ocean zooplankton are to be seen inside PWS. The CPR survey is a cost-effective, ship-of-opportunity based sampling program supported in the past by the EVOS TC that includes local involvement and has a proven track record.

Estimated Budget: $664.1K total
EVOSTC Funding Requested: $279.5K including GA (9%)
FY12 $0, FY13 $66.8K, FY14 $68.8K, FY15 $70.7K, FY16 $73.1K

Non-EVOSTC Funds to be used: $384.6K
FY12 $0, FY13 $91.9K, FY14 $94.7K, FY15 $97.5K, FY16 $100.4K

Date: May 25, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Identify the problem the project is designed to address. Describe the background and history of the problem. Include a scientific literature review that covers the most significant previous work history related to the project.

<u>Justification</u>

The Continuous Plankton Recorder (CPR) transect samples the Alaskan shelf and crosses the slope into the open Gulf of Alaska, providing a record of taxonomically resolved near-surface zooplankton and large phytoplankton abundance over wide spatial scales. Many important species, including herring, forage outside of Prince William Sound for at least some of their life history (salmon, birds and marine mammals for example) so an understanding of the productivity of these shelf and offshore areas is important to understanding and predicting fluctuations in resource abundance. Our sampling transect extends from the inner part of Cook Inlet, onto the open continental shelf, across the shelf break and into the open Gulf of Alaska in a continuous fashion (Figure 1), enabling us to identify where the incidences of high or low plankton are and whether the whole region is responding in a similar way to meteorological variability. Evidence from CPR sampling over the past decade suggests that the regions are not synchronous in their response to ocean climate forcing.

Figure 1 Location of samples on a typical CPR transect (○) together with the Seward Line (+)

The funding requested is modest and because of the Consortium approach (the North Pacific CPR program is funded through a consortium managed by the North Pacific Marine Science organization, PICES) is less than half the actual cost of the data collection. The project has a proven track record with a high sampling success rate, all past deliverables have been fully met and there is a strong record of primary publications resulting from the program; the funding would likely generate a very positive return for the EVOS TC. SAHFOS has trained local technicians to service the CPRs and uses the Horizon shipping company for the sampling so that ~10% of the requested funding will be returned to the region.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled “Long-Term Monitoring of Marine Conditions and Injured Resources and Services,” and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

Project Objectives

The fundamental goal of this program is to provide continued large spatial scale data on zooplankton populations to extend the existing time series and integrate the data with more regional, locally more intensive, sampling programs. More specifically, we will provide monthly (spring to fall – typically April to September) sampling of zooplankton and large phytoplankton along the transect from the oceanic Gulf of Alaska to Cook Inlet, analyzing every 4th oceanic and every shelf sample to provide taxonomically resolved abundances. Temperature loggers have been fitted to some CPRs in the past and from 2010 we are endeavouring to maintain in situ temperature data collection on this transect.

Project Integration

Work is currently underway to compare the CPR sampling with historic and concurrent plankton data collected from within PWS to examine the links between zooplankton within and outside of the Sound under EVOS TC project 10100624, as part of the herring restoration program. This would continue within the current proposed work as only a short time series of taxonomically resolved plankton data from PWS will be generated by 2012. We also here propose to integrate CPR sampling with the twice-yearly zooplankton sampling along the Seward Line (which intersects the CPR transect at its outermost stations, Fig 1) and the continuous oceanographic framework provided by the GAK-1 sampling.

CPR sampling has strengths (robust, cost-effective and large scale) but it also has limitations (near surface sampling only, small sample volumes and robust sampling mechanism that may cause underrepresentation of rarer and/or fragile organisms). The PWS and Seward Line zooplankton sampling are complementary by providing spatially detailed, full water column sampling in key point locations. The Seward Line sampling is carried out twice/year so the monthly resolution of the CPR will fill-in information on seasonality of shelf and off shore lower trophic levels.

Leveraging

PICES has endorsed the North Pacific CPR project since its inception in 2000. In 2007 PICES initiated a funding consortium to support the project, through relatively small contributions from agencies with interest in all or part of the region. At this time, the Canadian Department of Fisheries and Oceans (DFO) and the North Pacific Research Board (NPRB) have each made commitments through 2014 and we are also supported by the CPR parent organization, SAHFOS. The EVOSTC was instrumental in the establishment of the CPR program and has supported it through projects 030624, 040624, 070624 and currently to the PICES consortium through project 10100624 which extends through the 2012 field season.

B. Procedural and Scientific Methods

Project Approach and Logistics

We do not propose to make any changes to the sampling regime that has been operating so successfully. The cargo vessel *Horizon Kodiak* will tow a CPR northbound towards Cook Inlet approximately once per month between April and September each year. The samples will be unloaded and the gear serviced each time by Alaskan technicians who have been trained by

SAHFOS. Sample processing will be carried out at the DFO laboratory in Sidney, BC and at the SAHFOS laboratory. QC and sample archiving will be carried out by SAHFOS.

C. Data Analysis and Statistical Methods

Previous proposals have already described in detail the statistical validity of this approach and demonstrated that the sampling frequency and spacing is suitable to characterize seasonal, interannual and spatial variability at the mesoscale. Further information can be found in Batten et al., (2003) and previous funded EVOS TC proposals, but since our proposed sampling and processing protocols are unchanged and have been previously approved we are not repeating them extensively here.

Large scale patchiness (on the order of 10s to 100s of kms) needs to be considered as a factor that may contribute to observed variability in the plankton data. The greatest resolution possible from CPR data is 18.5 km, however, to maximise coverage with the resources available we process samples spaced 74 km in the open ocean (every fourth sample being processed) but all samples on the shelf. An individual sample will pass through small patches of plankton and so provide an ‘average’ of the small-scale patchiness. We have established the decorrelation length-scales for common taxa from data collected early in the survey (2000) and determined that samples that are spaced well apart, such as every 74 km, are likely to be representative and not likely to be within or outside of a patch.

Our methodology has remained unchanged since the survey’s inception so comparisons with historical CPR data are straightforward. Comparisons with other plankton sampling are more problematic as each sampling system has a bias of some sort caused by, for example, mesh size, depth of sampling, taxonomic resolution. However, by using indices such as anomalies and pooling taxa to create functional groups useful comparisons can be made. Such work is currently underway under project 10100624 and will continue here, as described above.

D. Description of Study Area

The project will sample waters on a transect from the Straits of Juan de Fuca outside of Puget Sound (48.45°N, 125°W, Captain’s discretion) across the Gulf of Alaska to Cook Inlet and Anchorage. Sampling will end at about 60ºN, 151.9°W (at Captain’s discretion). See Figure 1 for a map of the transect. Ship tracks vary minimally from month to month.

Figure 1 Location of samples on a typical CPR transect (○) together with the Seward Line (+)

E. Coordination and Collaboration with Other Efforts

See Leveraging and Integration sections above**.**

Budget
Funding is already provided for the 2012 field sampling and work up, under the existing project 10100624. Costs below are for 2013 onwards and commence at a similar level to 2012. Modest annual inflationary increases are requested for subsequent years (3%).

III. SCHEDULE

A. Project Milestones

Objective 1. Sample collection on the transect from Cook Inlet to Puget Sound will begin in spring 2012 and continue approximately monthly through to August/September 2012 (6 transects will be sampled). This schedule will be repeated each year to 2016. All shelf samples will be processed and every 4th oceanic sample.

Objective 2. A subset of samples (25%) will be processed within 3 months of collection at the Institute of Ocean Sciences (DFO, Canada) and results from this processing (e.g. estimated mesozooplankton biomass and comparisons with data from previous years) will available in progress reports and on the project website as soon as practicable. Full, quality controlled data from 2012 will be available by August 2013, and in a similar fashion in subsequent years (e.g. August 2014 for data collected within 2013).

B. Measurable Project Tasks

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)

December:	Processing and initial analysis of samples collected in summer/fall 2011 will be completed.

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)

January:	Attend Annual Science Symposium
February:	Shipping of serviced CPR from UK to Horizon Kodiak
March/April:	First transect sampled

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)

April:	Begin sample processing (ongoing hereafter)
April-June:	Three transects sampled
June:	First results from 2010 sampling available (ongoing hereafter)

FFY 12, 4th quarter (July 1, 2012-September 30, 2012)

July-Sept:	Two transects sampled, CPR shipped back to UK for overhaul.
August:	Final QC data from 2011 available

FFY 13, 1st quarter (October 1, 2012-December 31, 2012)

October:	Attend annual PICES meeting

December:	Processing and initial analysis of samples collected in summer/fall 2011 will be completed

Subsequent years will follow the same pattern until:

FFY 17, 3rd quarter (April 1, 2012-June 30, 2017)

April 15	Submit final report.

Budget Justification

The North Pacific CPR survey is supported by a Consortium managed by the North Pacific Marine Science Organisation (PICES), of which the EVOS TC is a member. Costs included here are estimated at 40% of the full costs of acquiring data along the north-south transect. The proposal and budget asks for a contribution to the CPR funding consortium to enable sampling and analysis of samples from the northern Gulf of Alaska to be maintained at the current resolution (6 times per year March-September, all shelf samples processed and every 4th oceanic sample) after 2012 which is currently funded through project 10100624. The North Pacific Research Board and Canadian Department of Fisheries and Oceans (DFO) are each contributing to the consortium at a similar level to this request (until 2014 under current agreements). The CPR parent organization, Sir Alister Hardy Foundation for Ocean Science (SAHFOS) is also providing salary support for some of the UK-based personnel.

Personnel

S. Batten will manage the day to day running of the project, carry out research on the data and complete reports and publications. D. Moore is the technician based in Sidney, BC who will process the samples and carry out some sample analysis. The SAHFOS team of analysts will complete the sample analysis and sample curation. Small amounts of time are allocated for other personnel to liaise with the shipping company (P. Pritchard), technicians to set up/repair the CPRs at the start/end of the field season and the data manager (D. Stevens) to collate, check and deliver the finalized data. Salaries have been increased by 3% in each year after FY12 (which is currently funded by project 10100624). There is no overtime and the salary costs include National Insurance and pension contributions.

Personnel	Time allocated per yr 2012-16	FY 2013	FY 2014	FY 2015	FY 2016
S Batten	1.2	$8,955	$9,2234	$9,500	$9,786
Doug Moore	1.4	$7,765	$7,998	$8,238	$8,485
Technicians - workshop	0.3	$1,617	$1,666	$1,716	$1,767
Technicians - analysts	2.0	$10,163	$10,468	$10,782	$11,105
D Stevens	0.3	$1,830	$1,885	$1,942	$2,000
P Pritchard	0.2	$1,493	$1,537	$1,583	$1,631
Total	5.4 mo	$31,822.80	$32,777.50	$33,760.80	$34,773.70

Travel

A proportion (20%) of estimated costs for the PI to attend the Alaska Science Symposium in Anchorage and the PICES annual meeting is requested for FY13-16.

Contractual

Lease of CPRs from SAHFOS is included here. 40% of the costs for 6 tows per year = $3373 in FY13 increasing by 3% per year in subsequent years.

A proportion of the costs for shipping CPRs to and from the port of Tacoma at the start/end of the field season is also included at $1311 in FY13, increased by 3% per year in subsequent years.

Servicing of the CPRs by SAHFOS-trained technicians in Anchorage is included at $2,472 in FY13 increased by 3% in subsequent years.

A gratuity is given to the ship's crew for each transect sampled and a proportion (40%) included here: $705 in FY13 increased by 3% in subsequent years.

A contribution to the computing services costs in the UK and maintenance of the project website by PICES is included here at $205 and $412 respectively in FY13 increased by 3% in subsequent years.

Commodities
A proportion (40%) of the costs for shipping samples between Anchorage and the DFO and SAHFOS labs is included at $367 in FY13 increased by 3% in subsequent years.
40% of the costs of the filtering mesh are included ($223 per mechanism): $1652 in FY13, increased by 3% in subsequent years.
A proportion of the tow wires and lab consumables are included at $433 and $764 in FY2013 respectively, increased by 3% in subsequent years.

Equipment
No new equipment will be purchased, existing microscopes and CPRs will be used.

Indirect costs
45% of the salaries are added as an indirect cost (personnel at SAHFOS and technicians in BC and Anchorage). This will be split 40% to SAHFOS and 5% retained by PICES.

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$31.8	$32.7	$33.8	$35.0	$133.3
Travel	$0.0	$1.0	$1.0	$1.0	$1.1	$4.1
Contractual	$0.0	$7.2	$7.4	$7.5	$7.9	$30.0
Commodities	$0.0	$4.5	$4.7	$4.8	$4.8	$18.8
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)		$16.8	$17.3	$17.8	$18.3	$70.2
SUBTOTAL	$0.0	$61.3	$63.1	$64.9	$67.1	$256.4
General Administration (9% of subtotal)	$0.0	$5.5	$5.7	$5.8	$6.0	$23.1
PROJECT TOTAL	$0.0	$66.8	$68.8	$70.7	$73.1	$279.5
Other Resources (Cost Share Funds)	$0.0	$91.9	$94.7	$97.3	$100.7	$384.6

The North Pacific CPR survey is supported by a Consortium managed by the North Pacific Marine Science Organisation, of which the EVOS TC is a member. Costs included here are estimated at 40% of the full costs of acquiring data along the north-south transect. The remining funds will come from the consortium which currently includes the NPRB, Canadian Dept Fisheries and oceans and SAHFOS.

FY12-16

Program Title:
Team Leader:

FORM 3A
NON-TRUSTEE AGENCY
SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY12

Program Title:
Team Leader:

FORM 3B
PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY12

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
S Batten	Long term monitoring of zooplankton	1.2	7.5	0.0	9.0
Doug Moore	populations on the Alaskan Shelf and Gulf	1.4	5.6	0.0	7.8
Technicians - workshop	of Alaska using Continuous Plankton recorders	0.3	5.4	0.0	1.6
Technicians - analysts		2.0	5.0	0.0	10.0
D Stevens		0.3	5.7	0.0	1.8
P Pritchard		0.2	7.5	0.0	1.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	36.7	0.0	
				Personnel Total	$31.8

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
Portion of PI's travel to Alaska marine Science meeting and PICES annual					1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY13

Program Title:
Team Leader:

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Portion of local CPR servicing in Anchorage	2.5
Portion of CPR leasing	3.4
Portion of computing services	0.2
Portion of website maintenance by PICES	0.4
Portion of tow payment to ship	0.7
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	7.2

Commodities Costs: Description	Commodities Sum
lab consumables	0.8
Shipping of gear	1.2
shipping of samples	0.4
filtering mesh	1.7
Tow wires	0.4
Commodities Total	4.5

FY13

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
existing CPRs will be used. Lease costs charged above cover replacement/repair		
external bodies	1	
internal mechanisms	4	
Existing microscopes will also be used, (including one purchased in FY03)	7	

FY13

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
S Batten	Long term monitoring of zooplankton	1.2	7.7		9.2
Doug Moore	populations on the Alaskan Shelf and Gulf	1.4	5.7		8.0
Technicians - workshop	of Alaska using Continuous Plankton recorders	0.3	5.6		1.7
Technicians - analysts		2.0	5.2		10.4
D Stevens		0.3	5.9		1.9
P Pritchard		0.2	7.7		1.5
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	37.8	0.0	
				Personnel Total	$32.7

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
Portion of PI's travel to Alaska marine Science meeting and PICES annual					1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY14

Program Title:
Team Leader:

FORM 3B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Portion of local CPR servicing in Anchorage	2.6
Portion of CPR leasing	3.5
Portion of computing services	0.2
Portion of website maintenance by PICES	0.4
Portion of tow payment to ship	0.7
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	7.4

Commodities Costs: Description	Commodities Sum
lab consumables	0.8
Shipping of gear	1.4
shipping of samples	0.4
filtering mesh	1.7
Tow wires	0.4
Commodities Total	4.7

FY14

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
existing CPRs will be used. Lease costs charged above cover replacement/repair		
external bodies	1	
internal mechanisms	4	
Existing microscopes will also be used, (including one purchased in FY03)	7	

FY14	**Program Title:** **Team Leader:**	**FORM 3B** **EQUIPMENT DETAIL**

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
S Batten	Long term monitoring of zooplankton	1.2	7.9		9.5
Doug Moore	populations on the Alaskan Shelf and Gulf	1.4	5.9		8.3
Technicians - workshop	of Alaska using Continuous Plankton recorders	0.3	5.7		1.7
Technicians - analysts		2.0	5.4		10.8
D Stevens		0.3	6.1		2.0
P Pritchard		0.2	7.9		1.6
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	38.9	0.0	
				Personnel Total	$33.8

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
Portion of PI's travel to Alaska marine Science meeting and PICES annual					1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY15

Program Title:
Team Leader:

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Portion of local CPR servicing in Anchorage	2.6
Portion of CPR leasing	3.6
Portion of computing services	0.2
Portion of website maintenance by PICES	0.4
Portion of tow payment to ship	0.7
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$7.5

Commodities Costs: Description	Commodities Sum
lab consumables	0.8
Shipping of gear	1.3
shipping of samples	0.4
filtering mesh	1.8
Tow wires	0.5
Commodities Total	4.8

FY15	**Program Title:** **Team Leader:**	**FORM 3B** **CONTRACTUAL &** **COMMODITIES DETAIL**

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
existing CPRs will be used. Lease costs charged above cover replacement/repair		
external bodies	1	
internal mechanisms	4	
Existing microscopes will also be used, (including one purchased in FY03)	7	

FY15

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
S Batten	Long term monitoring of zooplankton	1.2	8.2		9.8
Doug Moore	populations on the Alaskan Shelf and Gulf	1.4	6.1		8.5
Technicians - workshop	of Alaska using Continuous Plankton recorders	0.3	5.9		1.8
Technicians - analysts		2.0	5.6		11.2
D Stevens		0.3	6.3		2.0
P Pritchard		0.2	8.2		1.6
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	40.3	0.0	
				Personnel Total	$35.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
Portion of PI's travel to Alaska marine Science meeting and PICES annual					1.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.1

FY16

Program Title:
Team Leader:

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Portion of local CPR servicing in Anchorage	2.7
Portion of CPR leasing	3.7
Portion of computing services	0.2
Portion of website maintenance by PICES	0.5
Portion of tow payment to ship	0.8
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	7.9

Commodities Costs: Description	Commodities Sum
lab consumables	0.8
Shipping of gear	1.3
shipping of samples	0.4
filtering mesh	1.8
Tow wires	0.5
Commodities Total	4.8

FY16	**Program Title:** **Team Leader:**	**FORM 3B** **CONTRACTUAL &** **COMMODITIES DETAIL**

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
existing CPRs will be used. Lease costs charged above cover replacement/repair		
external bodies	1	
internal mechanisms	4	
Existing microscopes will also be used, (including one purchased in FY03)	7	

FY16

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long term monitoring: Program management component – Administration, Science Review Panel and PI Meeting Logistics, and Outreach and Community Involvement

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Nancy Bird, PWS Science Center, and Molly McCammon, AOOS

Study Location: Prince William Sound, Lower Cook Inlet, Resurrection Bay and Gulf of Alaska

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et al. This Detailed Project Description (DPD) addresses administration and fiscal management of the program, travel and logistics for science review, principal investigator annual meetings, and the Outreach Steering Committee, and administrative support for the Outreach and Community Involvement component of the LTM program. In order to be most fiscally efficient, the Prince William Sound Science Center is serving as the administrative lead and fiscal agent for the consortium submitting this proposal, as well as for the Herring Program. The Outreach and Community Involvement component will be coordinated by the Alaska Ocean Observing System.

Estimated Budget: $1,301.0k Total without the 9%GA - $1,418.2K including 9%GA
EVOSTC Funding Requested: *(breakdown by fiscal year and must include 9% GA)*

FY12	FY13	FY14	FY15	FY16	TOTAL
$263.3	$274.7	$298.6	$293.4	$288.1	$1,418.2

Non-EVOSTC Funds to be used:
(breakdown by fiscal year)

Date: June 1, 2011

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Efficient and cost-effective administration of the $10.5 million Long-Term Monitoring (LTM) program is proposed by the Prince William Sound Science Center (PWS Science Center) in combination with the Outreach and Community Involvement component of the LTM program. The EVOS Trustee Council requested that a consortium submit one proposal for the LTM program. Our consortium includes three primary organizations: the PWS Science Center (PWSSC) acting as the administrative lead and fiscal agent, the NOAA Kasitsna Bay Laboratory (KBL) serving as the science program lead, and the Alaska Ocean Observing System (AOOS) providing data management and outreach and community involvement services and serving as the Team Lead and primary point of contact for the overall program. Collectively, this consortium brings a wealth of knowledge about the spill-affected region, has extensive experience with managing multi-million dollar science programs with multiple partners, and has the capacity to leverage significant additional dollars.

This Detailed Project Description (DPD) addresses administration of the program, travel and logistics for science review and principal investigator annual meetings, and the Outreach and Community Involvement components of the LTM program.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled “Long-Term Monitoring of Marine Conditions and Injured Resources and Services,” and submitted by McCammon et al.

II. PROJECT DESIGN

A. Objectives

Objective 1 **Fiscal management tasks**

a. Award and management of all contracts and subawards for non-Trustee organizations involved in this program (this will total 6 contracts[1] in addition to the 2 PWSSC projects);
b. Timely submission of financial reports;
c. Completion of annual audits; and
d. Monitoring of project spending.

The budget assumes that funding to Trustee agencies will be provided directly to that agency and not through the PWSSC. The PWSSC will contract to all non-Trustee organizations involved in this proposal, with two exceptions for two co-PIs who are working with Trustee agency projects (Straley from University of Alaska Southeast and Dean from Coastal Resources Associates). Straley and Dean’s participation is included as contracts within, respectively, the Moran (NOAA) and Ballachey (USGS) Trustee agency project DPDs and budgets.

---

[1] Six contracts will be awarded to the Univ. of Alaska Fairbanks (Hopcroft, Weingartner, Konar, Ikens), SAHSOF (Batten), North Gulf Oceanic Society (Matkin), Alaska SeaLife Center (Hollmen), Alaska Ocean Observing System through Axiom Consulting (McCammon/Bochenek), and Alaska Ocean Observing System (McCammon).

Objective 2 **Formation and operation of a scientific review panel**
Costs associated with the **formation and operation of a scientific review panel** for the LTM program is included in the administrative fee. These costs include administrative assistance and travel arrangements and expenses.
Background: (See Tab 1, Section G, of the LTM proposal submitted March 1, 2011)
"To accomplish proper scientific oversight of this long-term monitoring research program, Science Team Leader Kris Holderied will recruit four members for a scientific oversight panel to help guide the program and ensure that the monitoring program is relevant to the long-term goal. We anticipate that the oversight panel will consist of people representing Alaska Department of Fish and Game, the National Oceanic and Atmospheric Administration, academia, and local community perspective. There will be annual Principal Investigator meetings each year to provide updates to this oversight panel, improve coordination between projects, and provide outreach and public input opportunities. This meeting will also serve as an opportunity to review results from summer field seasons and provide input on the development of the following year's work plan. In developing this proposal we solicited input from ADF&G, NOAA, USGS, NPS, university researchers, and community members. Team development and input on research direction was also sought at the 2011 Alaska Marine Science Symposium. We intend to continue this scientific outreach throughout the 5-year program."

Objective 3 **Travel expenses for the Annual Meeting of LTM PIs**
The travel portion of the administrative budget **includes funds for an annual meeting** in Anchorage of the project principal investigators.

Objective 4 **Travel expenses for Outreach Team**
Administrative assistance and travel arrangements and expenses for activities directed by the Outreach and Community Involvement Team, led by McCammon, are included in this project.

Objective 5 **LTM Project Outreach and Community Involvement**
I. Overall Approach
The outreach/community involvement component of the LTM Project will be facilitated by the Alaska Ocean Observing System (AOOS), with significant leveraging of the resources of these institutions: the Prince William Sound Science Center (PWSSC) and Oil Spill Recovery Institute (OSRI) based in Cordova, the Alaska SeaLife Center (ASLC) in Seward, the Kachemak Bay Research Reserve (KBRR) in Homer, and COSEE Alaska (Center for Ocean Science Education Excellence). Once we receive final authorization from the Trustee Council, we plan to meet first with the existing EVOS TC Public Advisory Group as well as reach out to the communities in the oil spill region to discuss and refine our proposed activities for outreach and community involvement. We also plan to coordinate our efforts closely with those for the Herring Project, which are primarily focused in Prince William Sound.

Our partner organizations offer a wide range of capabilities including websites and web materials, teacher workshops, distance learning programs, newspaper and magazine articles, radio and television programs, science camps, and community lectures. They have experienced education and communication staff, and are connected with statewide, regional, national and international education and outreach programs.

We will establish an Outreach and Community Involvement Steering Committee made up of education/outreach specialists from AOOS, COSEE Alaska, PWSSC/OSRI, KBRR, and the ASLC, as well as appropriate agency experts. AOOS will facilitate this committee. The committee will decide on final activities, and either select an entity to be responsible for a specific product, or in some cases, hold a small competitive process, or even a mini-grant program, for potential activities.

II. Specific Activities

A. Annual Activities

- Meet with EVOS TC Public Advisory Committee each August.
- Participate in annual PI meeting – likely in November.
- Participate in annual Wisdomkeeper Conference if held.
- Update written and web-based materials describing overall 5-year program and individual components: project profiles and bi-annual project updates.
- Participate in regional science symposia (Kodiak, Homer, Cordova, Valdez) and statewide Alaska Marine Science Symposium in Anchorage and ensure involvement of LTM Project PIs.
- Participate in annual Herring PI Meeting in Cordova in May.
- Contribute to annual Delta Sound Connections newsletter.
- Develop 1-2 Field Notes short radio programs (which may also include a slide show or video piece) describing components of the LTM program and distributed to radio stations throughout the region and shared through the website and YouTube.

B. Year 1 additions

- Develop project website that can be accessed via multiple portals.
- Begin discussions with PWS and Lower CI communities on potential for community-based citizen science monitoring program.
- Develop written and web-based project materials.

C. Year 2 additions

- Hold conference on potential for community-based citizen science monitoring program: how to incorporate local and traditional knowledge into long-term monitoring program.
- Develop data visualizations for website.

D. Year 3 additions

- Participate in the science review conference for both the LTM and Herring Research programs. Share results from citizen science monitoring conference (held in year 2) with the scientists.

E. Year 4 additions

- Implement citizen science monitoring program as possible (based on financial constraints).

F. Year 5 additions

- Develop written and web-based materials summarizing current state of knowledge from program.

III. Coordinate with the Herring Research Program’s Outreach & Community Involvement Activities. These will be done by the PWSSC/OSRI education staff and include:

- Use annual Principal Investigator meetings to keep public informed.
- Work closely with Cordova District Fishermen United to gather input on the programs from the fishing community and work with them on sample collection efforts.
- Use the herring survey website (http://www.pwssc.org/herringsurvey/) as another tool for keeping people informed with project profiles and articles in the *DeltaSound Connections*, a broadly distributed annual paper describing research in PWS and Copper River Delta.
- Develop three Field Notes radio programs each year to be aired by KCHU, the PWS public radio station and focusing on different aspects of the program.
- Provide three lectures each year at minimum on various components of Herring Program as part of the PWSSC community lecture series held weekly through the winter and transmitted to Valdez through the Prince William Sound Community College.
- Incorporate results from projects into PWSSC classroom and summer camp activities. These camps involve youth from around Prince William Sound and the Anchorage area.

In addition, since the first year of the new PWS Herring Monitoring Program overlaps with the existing PWS Herring Survey Program, the Herring Program outreach program will use the overlap period to:

- Increase the geographic impact of the programs by modifying the current PWS herring school-year and summer activities so that the focus is on how a fishery (PWS herring) is affected by changes in the ecosystem. The resultant activities will focus on the ecosystem, which is more transferable, than on a particular fish population. At the same time it will continue to use PWS herring as the central example, which maintains its relevance to this program and
- Market the revised programs to other marine education programs in the state.

B. Procedural and Scientific Methods

Not applicable.

C. Data Analysis and Statistical Methods

Not applicable.

D. Description of Study Area

Administrative services will be completed at the PWSSC office in Cordova.
Science review and PI meetings will be held in Anchorage or elsewhere in the EVOS region.
Outreach and community involvement activities will be completed throughout the EVOS region.

E. Coordination and Collaboration with Other Efforts

Please also see Tab 4 of the LTM proposal submitted March 1, 2011, and Section III of Objective 5 listed above (coordination with the Herring Research Program's Outreach activities)

Our partner organizations offer these capabilities:
AOOS: AOOS is the only organization in the state with a board made up of all the federal and state resource management agencies and all the marine research entities in Alaska, including the University of Alaska. The AOOS mission is to coordinate and facilitate the gathering and dissemination of ocean and coastal information and data products to meet stakeholder needs in the three Large Marine Ecosystems, including the Gulf of Alaska. AOOS has committed significant resources to its web-based data portal (www.aoos.org) and data products developed in response to stakeholder needs. As part of a national - as well as a global - network of ocean observing systems, AOOS has access to significant national and international resources as well. AOOS will facilitate the outreach/community involvement program, and use its web portal as a key outlet for products to be developed.

AOOS is a major partner of COSEE Alaska, a network of ocean education and science partners that engages ocean scientists, teachers, informal educators and community members in the region in a broad range of programs, including statewide ocean science fairs, teacher workshops, Communicating Ocean Science Workshops and hands-on sessions for scientists at the Alaska Marine Science Symposium, plus distance learning and virtual field trips through the COSEE Alaska website (www.coseealaska.net).

PWSSC and OSRI: Based in Cordova, these organizations are the primary contact point for communities and education programs in the sound. The organizations' education resources will provide articles in the Delta-Sound Connections, a broadly distributed annual paper describing research in PWS and Copper River Delta. They also will develop Field Notes radio programs each year to be aired by KCHU, the PWS public radio station. The organizations will also take advantage of the PWSSC community lecture series held weekly through the winter and transmitted to Valdez through the Prince William Sound Community College. Results from the research will also be incorporated into the PWSSC classroom and summer camp activities. These camps involve youth from around Prince William Sound and the Anchorage area.

KBRR: For Cook Inlet/Kachemak Bay, the Kachemak Bay Research Reserve and the Kasitsna Bay Lab will support outreach and education services at: KBRR Discovery Labs (free-learning science education events for general public and K-12); "Bay Science" articles in Homer News, Homer Tribune and Peninsula Clarion papers; "Kachemak Currents" informational radio spots on science topics; K-12 science camps at Kasitsna Bay Lab (serving approximately 25 groups and 700 students) and marine science classes (university as well as continuing education for tribal environmental coordinators and teachers) at Kasitsna Bay Lab.

ASLC: The SeaLife Center operates America's northern-most research aquarium as a non-profit organization and is both a major marine research center and one of Alaska's largest marine tourism attractions. The ASLC has a multi-faceted formal and informal education and outreach program, employing 6 full time educators, year round and seasonal interpreters, with 2 full time exhibit design experts. These staff work closely with both in house and external scientists and educators to develop education and outreach exhibits within and outside the Center. The Center is also the designated Alaska Coastal Ecosystem Learning Center under the Coastal America Partnership – a network of some 23 aquariums nationally who receive more than 20 million visitors/year. This network is now supported by the NOAA-Smithsonian Ocean Today Kiosk program and the ASLC has a direct daily download link to the OTK hub at the Smithsonian. The Center has a long established and interactive Exxon Valdez Oil Spill exhibit featuring the latest updates from the EVOSTC science program. This exhibit is popular, but could be readily enriched by improved interactive exhibits, expanded distance education offerings (the ASLC is currently Alaska's largest provider of marine distance education programs to lower 48 and international schools with some 300 lessons provided in 2010), shared mobile exhibit materials, and portable presentation materials on the monitoring program that could be made available to monitoring team members to use in a range of professional and school/community based presentation forums

Community involvement: Communities in the spill-affected region include both the larger communities of Valdez, Cordova, Homer, Kenai and Kodiak, as well as the smaller Alaska Native villages such as Tatitlek and Chenega, Port Graham and Nanwalek, and Kodiak Island villages. We propose to develop outreach materials specifically targeted to these communities, in essence bringing science to the communities. We propose to host mini-science symposiums in spill area communities, and contribute to the proposed Wisdomkeeper conference sponsored by spill area communities. In this 5-year proposal, we propose to begin discussions with spill-area communities (primarily Prince William Sound and lower Cook Inlet) concerning development of a potential community-based citizen science monitoring program. We propose to hold a conference on this issue in Year 2 of this proposal, and seek additional funding sources (primarily through private sources) to implement such a program that would incorporate local and traditional Alaska Native knowledge into ongoing monitoring efforts.

III. SCHEDULE
A. Project Milestones

Objective 1. Fiscal Management
Initial contract awards to non-Trustee agency organizations issued by January 2012 (assuming Trustee Council award to PWS Science Center is complete by December 2011).
System established for quarterly fiscal project monitoring by April 2012
Annual audits conducted.

Objective 2. Assist with Scientific Review Panel

Panel to be established by January 2012. Other activities ongoing.

Objective 3. Support travel and logistics for annual PI meetings
To be held annually, tentatively in November.

Objective 4. Support Outreach Steering Committee
Ongoing support for travel and logistics

Objective 5. Coordinate Outreach and Community Involvement Activities
Establish Steering Committee by January 2012
Establish public website portal by February 2012
Meet with EVOS TC Public Advisory Committee by March 2012
Develop Outreach and Community Involvement Plan by April 2012
Implement Plan - ongoing

B. Measurable Project Tasks

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)
Project funding approved by Trustee Council
Contracts awarded to non-Trustee agency organizations
Assist Science Team Leader with meeting setup and travel logistics for first PI meeting
Assist Science Team Leader with formation of scientific review panel
Attend coordination meetings (expected with EVOS TC staff and with administrative, data management and ecological model teams)
Establish Outreach and Community Involvement Steering Committee (Outreach Steering Committee)

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)
Attend Alaska Marine Science Symposium and present on LTM program plan
Develop project website accessible from multiple portals
Develop written and web-based materials describing LTM program
Outreach Steering Committee meet with EVOS TC Public Advisory Committee to discuss opportunities for outreach and community involvement
Outreach Steering Committee develops Outreach and Community Involvement Plan
Monitor project spending.

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)
Submit proposed workplan for FFY 13
Monitor project spending.
Outreach Steering Committee attendance at Herring PI meeting
Participate in regional science symposia (Kodiak, Homer, Cordova, Valdez)

FFY 12, 4th quarter (July 1, 2012-September 30, 2012)
Monitor project spending.
Develop 1-2 Field Notes short radio programs that may include video or slide show

Meet with EVOS TC Public Advisory Committee (August?)
Submit annual report on monitoring efforts in the LTM program

FFY 13 (October 1, 2012-September 30, 2013)
Assist Science Team Leader with meeting setup and travel logistics for PI meeting
Attend annual PI meetings of LTM and Herring Research programs
Attend Alaska Marine Science Symposium
Assist in planning of joint LTM-herring program workshop in FFY 14
Hold conference on potential for community-based citizen science monitoring program
Develop 1-2 Field Notes short radio programs that may include video or slide show
Participate in regional science symposia (Kodiak, Homer, Cordova, Valdez)
Outreach Steering Committee contribution to annual Delta Sound Connections newsletter
Develop data visualizations for website; update written and web-based materials describing LTM program
Meet with EVOS TC Public Advisory Committee (August?)
Submit annual report on monitoring efforts in the LTM program
Submit proposed work plan for FFY 14

FFY 14 (October 1, 2013-September 30, 2014)
Assist Science Team Leader with meeting setup and travel logistics for PI meeting
Attend annual PI meetings of LTM and Herring Research programs
Attend Alaska Marine Science Symposium
Participate in joint LTM-herring program workshop and share results from the citizen science monitoring conference (held in FY13)
Develop 1-2 Field Notes short radio programs that may include video or slide show
Participate in regional science symposia (Kodiak, Homer, Cordova, Valdez)
Outreach Steering Committee contribution to annual Delta Sound Connections newsletter
Update written and web-based materials describing LTM program
Meet with EVOS TC Public Advisory Committee
Submit annual report on monitoring efforts in the LTM program
Submit proposed work plan for FFY 15

FFY 15 (October 1, 2014-September 30, 2015)
Assist Science Team Leader with meeting setup and travel logistics for PI meeting
Attend annual PI meetings of LTM and Herring Research programs
Attend Alaska Marine Science Symposium
Develop 1-2 Field Notes short radio programs that may include video or slide show
Participate in regional science symposia (Kodiak, Homer, Cordova, Valdez)
Outreach Steering Committee contribution to annual Delta Sound Connections newsletter
Update written and web-based materials describing LTM program
Meet with EVOS TC Public Advisory Committee
Submit annual report on monitoring efforts in the LTM program
Submit proposed work plan for FFY 16

FFY 16 (October 1, 2015-September 30, 2016)
Assist Science Team Leader with meeting setup and travel logistics for PI meeting

Attend annual PI meetings of LTM and Herring Research programs
Attend Alaska Marine Science Symposium
Develop 1-2 Field Notes short radio programs that may include video or slide show
Participate in regional science symposia (Kodiak, Homer, Cordova, Valdez)
Outreach Steering Committee contribution to annual Delta Sound Connections newsletter
Update written and web-based materials describing LTM program
Meet with EVOS TC Public Advisory Committee
Submit proposal for next 5-year LTM program
Submit final report on monitoring efforts in the FFY 12-16 LTM program

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$118.8	$122.4	$130.4	$127.3	$129.9	$628.8
Travel	$48.3	$51.6	$55.6	$59.7	$61.7	$276.9
Contractual	$69.5	$75.0	$84.5	$81.2	$70.2	$380.5
Commodities	$5.0	$3.0	$3.4	$1.0	$2.5	$14.9
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	waived	waived	waived	waived	waived	waived
SUBTOTAL	$241.6	$252.1	$273.9	$269.2	$264.3	$1,301.1
General Administration (9% of subtotal)	$21.7	$22.7	$24.7	$24.2	$23.8	$117.1
PROJECT TOTAL	$263.3	$274.7	$298.6	$293.4	$288.1	$1,418.2
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: PWSSC proposes an inflation-adjusted, flat rate in lieu of its federal recognized IDC rate. Starting at $200K in FY12, this itemized budget includes expenses that would normally be charged to IDC, and ALSO INCLUDES travel and meeting setup costs that are direct program charges for the science review team, P.I. annual meeting, and Outreach and Communications travel, contracts and other activities.

FY12-16

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$118.8	$122.4	$130.4	$127.3	$129.9	$628.8
Travel	$48.3	$51.6	$55.6	$59.7	$61.7	$276.9
Contractual	$69.5	$75.0	$84.5	$81.2	$70.2	$380.5
Commodities	$5.0	$3.0	$3.4	$1.0	$2.5	$14.9
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	waived	waived	waived	waived	waived	waived
SUBTOTAL	$241.6	$252.1	$273.9	$269.2	$264.3	$1,301.1
General Administration (9% of subtotal)	$21.7	$22.7	$24.7	$24.2	$23.8	$117.1
PROJECT TOTAL	$263.3	$274.7	$298.6	$293.4	$288.1	$1,418.2
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: PWSSC proposes an inflation-adjusted flat rate in lieu of its federal recognized IDC rate. Starting at $200K in FY12, this itemized budget includes expenses that would normally be charged to IDC, and ALSO INCLUDES travel and meeting setup costs that are direct program charges for the science review team, P.I. annual meeting, and Outreach and Community Involvement travel, contracts and other activities.

FY12-16

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3A
NON-TRUSTEE
AGENCY SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Exec Director		2.0	12.9		25.8
Finance Director		3.0	8.4		25.2
Bookkeeper		7.0	5.4		37.8
Admin. Assistant		2.5	4.9		12.3
IT support		2.5	7.1		17.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	38.7	0.0	
				Personnel Total	$118.8

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Adminstrative staff Cordova to Anchorage	0.4	2	2	0.2	1.2
Travel for Science/Technical Committee review meetings					12.0
Travel for Outreach & Communications meetings & activities					16.0
Travel for LTM Annual Project mtg in Anchorage - 15 P.I.s plus 2 nights					15.0
Support for KRRB, ASLC, PWSSC/OSRI reps to attend TC PAC mtg	0.300	3	1.0	0.100	1.0
Two annual P.I. mtgs (herring & LTM) - outreach representatives travel	0.300	6	1.5	0.175	2.1
Regional science symposiums - attendance by outreach representatives	0.300	10	2.0	0.175	1.0
					0.0
					0.0
				Travel Total	$48.3

FY12	**Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications** **Team Leaders: Bird and McCammon**	**FORM 3B PERSONNEL & TRAVEL DETAIL**

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Meeting space rental for LTM Annual Project Meeting in Anchorage	0.5
Mini-grant program to support activities directed by Outreach Team	30.0
Develop project profiles 6 each year @ $1,000 each	6.0
Participate in *Delta Sound Connections* annual publication	1.5
AOOS personnel support for facilitation of project	5.0
Shared costs through the PWSSC:	
Electricity @$416/month	5.0
Office space rent @ $667/month	8.0
Vehicle use in Cordova	1.0
Postage @ $62/month	0.5
Audit (total cost estimated at $20K)	8.0
Insurance (total cost estimated at $30K)	1.5
Telephone @ $208/month	2.5
Contractual Total	$69.5

Commodities Costs: Description	Commodities Sum
Misc. office supplies	2.0
Computer and/or software	3.0
Commodities Total	$5.0

FY12

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Exec Director		2.0	13.1		26.2
Finance Director		3.0	8.6		25.8
Bookkeeper		7.0	5.7		39.9
Admin. Assistant		2.5	5.0		12.5
IT support		2.5	7.2		18.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	39.6	0.0	
				Personnel Total	$122.4

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Adminstrative staff Cordova to Anchorage	0.4	2	2	0.2	1.2
Travel for Science/Technical Committee review meetings					10.0
Travel for Outreach & Communications meetings & activities					18.0
Travel for LTM Annual Project mtg in Anchorage - 15 P.I.s plus 2 nights					16.0
Support for KRRB, ASLC, PWSSC/OSRI reps to attend TC PAC mtg	0.300	3	1.0	0.100	1.0
Two annual P.I. mtgs (herring & LTM) - outreach representatives travel	0.300	6	1.5	0.175	2.1
Regional science symposiums - attendance by outreach representatives	0.300	10	2.0	0.175	3.4
					0.0
					0.0
					0.0
					0.0
				Travel Total	$51.6

FY13

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Meeting space rental for Annual Project Meeting in Anchorage	0.6
Mini-grant program to support activities directed by Outreach Team	35.0
Develop project profiles 6 each year @ $1,000 each	6.0
Participate in *Delta Sound Connections* annual publication	1.5
AOOS personnel support for facilitation of project	5.0
Shared costs through the PWSSC:	
Electricity @$430/month	5.2
Office space rent @ $675/month	8.1
Vehicle use in Cordova	0.8
Postage @ $68/month	0.8
Audit (total cost estimated at $20K)	8.0
Insurance (total cost estimated at $30K)	1.5
Telephone @ $214/month	2.6
Contractual Total	$75.0

Commodities Costs: Description	Commodities Sum
Misc. office supplies	1.5
Computer and/or software	1.5
Commodities Total	$3.0

FY13

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Exec Director		2.0	13.3		26.6
Finance Director		3.0	8.7		26.1
Bookkeeper		7.0	5.7		39.9
Admin. Assistant		3.0	5.1		15.3
IT support		3.0	7.5		22.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	40.3	0.0	
				Personnel Total	$130.4

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Adminstrative staff Cordova to Anchorage	0.4	2	2	0.2	1.2
Travel for Science/Technical Committee review meetings					12.0
Travel for Outreach & Communications meetings & activities					20.0
Travel for LTM Annual Project mtg in Anchorage - 15 P.I.s plus 2 nights					16.0
Support for KRRB, ASLC, PWSSC/OSRI reps to attend TC PAC mtg	0.300	3	1.0	0.100	1.0
Two annual P.I. mtgs (herring & LTM) - outreach representatives travel	0.300	6	1.5	0.175	2.1
Regional science symposiums - attendance by outreach representatives	0.300	10	2.0	0.175	3.4
					0.0
					0.0
					0.0
					0.0
				Travel Total	$55.6

FY14

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Meeting space rental for LTM Annual Project Meeting in Anchorage	0.8
Mini-grant program to support activities directed by Outreach Team	40.0
Develop project profiles 6 each year @ $1,000 each	6.0
Participate in *Delta Sound Connections* annual publication	1.5
AOOS personnel support for facilitation of project	6.0
Shared costs through the PWSSC:	
Electricity @$450/month	5.4
Office space rent @ $690/month	8.3
Vehicle use in Cordova	1.0
Postage @ $75/month	0.9
Audit (total cost estimated at $20K)	10.0
Insurance (total cost estimated at $30K)	2.0
Telephone @ $220/month	2.6
Contractual Total	$84.5

Commodities Costs: Description	Commodities Sum
Misc. office supplies	1.4
Computer and/or software	2.0
Commodities Total	$3.4

FY14

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Exec Director		2.0	13.5		27.0
Finance Director		3.0	9.0		27.0
Bookkeeper		7.0	6.0		42.0
Admin. Assistant		2.5	5.0		12.5
IT support		2.5	7.5		18.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	41.0	0.0	
				Personnel Total	$127.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Adminstrative staff Cordova to Anchorage	0.5	2	2	0.2	1.4
Travel for Science/Technical Committee review meetings					12.0
Travel for Outreach & Communications meetings & activities					20.0
Travel for LTM Annual Project mtg in Anchorage - 15 P.I.s plus 2 nights					18.0
Support for KRRB, ASLC, PWSSC/OSRI reps to attend TC PAC mtg	0.400	3	1.0	0.100	1.3
Two annual P.I. mtgs (herring & LTM) - outreach representatives travel	0.400	6	1.5	0.175	2.7
Regional science symposiums - attendance by outreach representatives	0.400	10	2.0	0.175	4.4
					0.0
					0.0
					0.0
					0.0
				Travel Total	$59.7

FY15

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Meeting space rental for LTM Annual Project Meeting in Anchorage	1.0
Mini-grant program to support activities directed by Outreach Team	36.0
Develop project profiles 6 each year @ $1,000 each	6.0
Participate in *Delta Sound Connections* annual publication	2.0
AOOS personnel support for facilitation of project	6.0
Shared costs through the PWSSC:	
Electricity @$450/month	5.4
Office space rent @ $690/month	8.3
Vehicle use in Cordova	1.0
Postage @ $75/month	0.9
Audit (total cost estimated at $20K)	10.0
Insurance (total cost estimated at $30K)	2.0
Telephone @ $220/month	2.6
Contractual Total	$81.2

Commodities Costs: Description	Commodities Sum
Misc. office supplies	1.0
Computer and/or software	0.0
Commodities Total	$1.0

FY15

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Exec Director		2.0	13.6		27.2
Finance Director		3.0	9.1		27.3
Bookkeeper		7.0	6.2		43.4
Admin. Assistant		2.5	5.0		12.5
IT support		2.5	7.8		19.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	41.7	0.0	
				Personnel Total	$129.9

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Adminstrative staff Cordova to Anchorage	0.5	2	2	0.2	1.4
Travel for Science/Technical Committee review meetings					12.0
Travel for Outreach & Communications meetings & activities					22.0
Travel for LTM Annual Project mtg in Anchorage - 15 P.I.s plus 2 nights					18.0
Support for KRRB, ASLC, PWSSC/OSRI reps to attend TC PAC mtg	0.400	3	1.0	0.100	1.3
Two annual P.I. mtgs (herring & LTM) - outreach representatives travel	0.400	6	1.5	0.175	2.7
Regional science symposiums - attendance by outreach representatives	0.400	10	2.0	0.175	4.4
					0.0
					0.0
					0.0
					0.0
				Travel Total	$61.7

FY16

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Meeting space rental for LTM Annual Project Meeting in Anchorage	1.0
Mini-grant program to support activities directed by Outreach Team	25.0
Develop project profiles 6 each year @ $1,000 each	6.0
Participate in *Delta Sound Connections* annual publication	2.0
AOOS personnel support for facilitation of project	6.0
Shared costs through the PWSSC:	
Electricity @$450/month	5.4
Office space rent @ $690/month	8.3
Vehicle use in Cordova	1.0
Postage @ $75/month	0.9
Audit (total cost estimated at $20K)	10.0
Insurance (total cost estimated at $30K)	2.0
Telephone @ $220/month	2.6
Contractual Total	$70.2

Commodities Costs: Description	Commodities Sum
Misc. office supplies	1.0
Computer and/or software	1.5
Commodities Total	$2.5

FY16

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Administration, Meeting Travel/Logistics & Outreach and Communications
Team Leaders: Bird and McCammon

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
General Administration (9% of subtotal)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
PROJECT TOTAL	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In this box, identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

FY12-16

Program Title:
Team Leader:
Agency:

FORM 4A
TRUSTEE AGENCY
SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs: Name	Project Title	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY12

Program Title:
Team Leader:
Agency:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY12

Program Title:
Team Leader:
Agency:

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title:
Team Leader:
Agency:

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY13

Program Title:
Team Leader:
Agency:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY13

Program Title:
Team Leader:
Agency:

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title:
Team Leader:
Agency:

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs: Name	Project Title	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY14

Program Title:
Team Leader:
Agency:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY14

Program Title:
Team Leader:
Agency:

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title:
Team Leader:
Agency:

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY15

Program Title:
Team Leader:
Agency:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY15

Program Title:
Team Leader:
Agency:

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title:
Team Leader:
Agency:

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY16

Program Title:
Team Leader:
Agency:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY16

Program Title:
Team Leader:
Agency:

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title:
Team Leader:
Agency:

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term monitoring pelagic component - Long-term monitoring of seabird abundance and habitat associations during late fall and winter in Prince William Sound.

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Mary Anne Bishop, Ph.D., Prince William Sound Science Center, Cordova

Collaborators: Kathy Kuletz, Ph.D. US Fish & Wildlife Service, Migratory Bird Mgmt, Anchorage; John Moran, Auke Bay Lab, NOAA, Juneau; Michelle Buckhorn, Ph.D. & Richard Thorne, Ph.D. Prince William Sound Science Center, Cordova

Study Location: Prince William Sound

Abstract:
This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al. The vast majority of seabird monitoring in areas affected by the *Exxon Valdez* oil spill has taken place around breeding colonies during the reproductive season, a time when food is generally at its most plentiful. However, seabirds spend most of the year widely dispersed. Late fall through winter are critical periods for survival as food tends to be relatively scarce or inaccessible, the climate more extreme, light levels reduced, day length shorter and water temperatures colder. Post-spill ecosystem recovery and changing physical and biological factors all have the potential to affect PWS seabird populations. Of the seabirds that overwinter in PWS, nine species were initially injured by the *Exxon Valdez* oil spill, including three species that have not yet recovered (marbled murrelet, Kittlitz's murrelet and pigeon guillemot). Here we propose to continue to monitor from 2012 through 2016 seabird abundance, species composition, and habitat associations using multiple surveys (up to 5 surveys per season) during late fall and winter. The data will improve our predictive models of seabird species abundance and distribution in relation to biological and physical environmental factors. In addition, by monitoring the top-down forcing by seabirds, a major source of herring predation, this project will complement the suite of *PWS Herring Research & Monitoring* studies, including improved mortality estimates for herring population models. This project is part of the pelagic component within the integrated *Long-term Monitoring of Marine Conditions and Injured Resources and Services* submitted by McCammon et. al. Our project uses as observing platforms the vessels associated with the *LTM Humpback Whale surveys* and *PWS Herring Research & Monitoring Juvenile Herring Abundance Index* as well as the *Extended Adult Herring Biomass Surveys* and integrates the seabird observations with those studies.

Estimated Budget:
EVOSTC Funding Requested: *(breakdown by fiscal year and must include 9% GA)*
FY 12 $51.7, FY 13 $78.6, FY 14 $80.9, FY 15 $83.4, FY 16 $86.3
Non-EVOSTC Funds to be used:
(breakdown by fiscal year)

Date: May 25, 2011

PROJECT PLAN

I. NEED FOR THE PROJECT
A. Statement of Problem

Seabirds spend most of the year widely dispersed. At higher latitudes, late fall through winter are critical periods for survival as food tends to be relatively scarce or inaccessible, the climate more extreme, light levels reduced, day length shorter and water temperatures colder. Consequently daily energy requirements increase (Fort *et al*. 2009) and birds have to forage for a large proportion of daylight hours (Daunt *et al*. 2006). Wind and sea state are known to affect surface-feeding seabirds in particular (Dunn 1973, Taylor 1983) but diving birds can also be impacted (Harris and Wanless 1996, Piatt and Van Pelt 1997, Frederiksen *et al*. 2008).

Of the seabirds that overwinter in Prince William Sound (PWS), nine species were initially injured by the *Exxon Valdez* oil spill, including three species that have not yet recovered (marbled murrelet, Kittlitz's murrelet and pigeon guillemot. Nevertheless, the vast majority of seabird monitoring in areas affected by the Exxon Valdez oil spill has taken place around breeding colonies during the reproductive season, a time when food is generally at its most plentiful. Long-term monitoring of seabirds in PWS during winter is needed to understand how post-spill ecosystem recovery and changing physical and biological factors are affecting seabird abundance and species composition, as well as their distribution and habitat use.

Changes in the timing of biological events, geographic range and/or relative abundance of species, community structure, and system productivity can be indications of a changing ecosystem (Parmesan 2006). For example, a recent 10-year monitoring effort along the transition zone between the California Current and the Gulf of Alaska documented significant increases in seabird species diversity and relative abundance during the nonbreeding season that corresponded with a possible regime shift to cooler conditions (Sydeman et al. 2009).

In December 2004, we began monitoring seabird abundance and distribution in PWS during late fall and winter months. Initially our surveys were concurrent with hydroacoustic surveys for adult herring in northeast PWS. Beginning in March 2007, we expanded our winter survey efforts to other areas of PWS under EVOS Project 070814. Since then surveys have been conducted concurrent with either juvenile herring hydroacoustic surveys or with humpback whale surveys. Results from seven cruises conducted over two winters found consistent trends and species-distinct patterns in distribution. Habitat association modeling revealed that winter climate conditions may influence these distribution patterns (Dawson et al. *in review*). When we examined distribution at a fine- scale (1 km) using data from seabird transects with concurrent fish data, we found a positive association between presence of seabirds and predictable fish prey fields (Bishop et al. *in prep.*). Furthermore, our consumption model of herring predation quantified the potential impacts of such prey association by seabirds during the winter. Our model shows that seabirds consume ~3-10% of the total adult herring biomass during each winter and underscores the importance of further examination of top-down forcing (Bishop et al., *in prep, b*).

Post-spill ecosystem recovery and changing physical and biological factors all have the potential to affect PWS seabird populations. Here we propose to continue to monitor seabird abundance and habitat associations using multiple surveys during late fall and winter. While this proposal encompasses a five-year period, we would foresee this project continuing over a 20-year period in order for ecosystem changes to be detected.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled “Long-Term Monitoring of Marine Conditions and Injured Resources and Services,” and submited by McCammon et al.

This study specifically monitors several injured seabird species that overwinter in PWS. These include marbled murrelet, an injured species with an unknown recovery status, as well as pigeon guillemot, a species that has not recovered. Kittlitz’s murrelet is a species frequenting PWS during some winters that has not recovered. Other seabird species initially injured by the spill and wintering in PWS include common loon, cormorants (pelagic, red-faced, and double-crested), common murre and bald eagle. In addition, our project will provide information on the impact of these seabird species on Pacific herring, a species that has not recovered since the Exxon Valdez oil spill.

II. PROJECT DESIGN
A. Objectives

This project is part of the pelagic component of the Long-term Monitoring of Marine Conditions and Injured Resources and Services. There are two primary research goals for the pelagic team: population monitoring of key species groups, and understanding the energy flow through the pelagic ecosystem with key measurements. Objectives of this study include:

1) Characterize the spatial and temporal distribution of seabirds in PWS during late fall and winter.
2) Relate seabird presence to prey fields identified during hydroacoustic surveys.
3) Identify critical biological and physical habitat characteristics for seabirds across PWS within and between winters.
4) Utilize increased temporal sampling resolution to improve our estimates of consumption of herring by seabirds during the winter.

The monitoring of top down forcing by seabirds and whales, the largest predators on herring, will complement the suite of *PWS Herring Research & Monitoring* studies, including insertion of key data into the population modeling of herring In addition, this project will provide information on the wintering ecology of several seabird species injured by the oil spill that can be used to help restore and/or conserve their populations.

B. Procedural and Scientific Methods

This study will be a continuation of systematic late fall and winter seabird surveys begun in 2007 by Bishop and Kuletz. Surveys will be conducted during the months of October, November, December, February, and late March/early April. Depending on the vessel of opportunity used, surveys will either be coupled with the *LTM Humpback Whale systematic surveys*. (October, December, February) or with surveys associated with the *PWS Herring Research and Monitoring* including *Juvenile Herring Abundance Index* in November and *Expanded Adult Herring Surveys* in late March/early April).

All surveys will employ established U.S. Fish and Wildlife Service protocols that have been adapted for GPS-integrated data entry programs (USFWS 2007). One observer will record number and behavior of birds and marine mammals occurring along a strip transect width of 300 m (150 m both sides and ahead of the boat, in distance bins of 50m). Additionally, any noteworthy observations will be recorded out to 1 km either side. Observations will be recorded into a GPS-integrated laptop computer using the program Dlog (Ford Consulting, Inc., Portland OR). This GPS-integrated program provides location data at 20-sec intervals and for every entered observation program. In addition, sea conditions including sea surface temperature (as indicated on the vessel's fish finder) and weather can be entered and tracked on site by the observer.

Seabird transects that are coupled with hydroacoustic fish surveys will occur in four to eight select bays in PWS. Seabird transects will also be conducted when the boat is in transit during daylight hours. Seabird surveys conducted onboard humpback whale surveys will follow specified routes from northeast to southwest PWS. Depending on the results from the 2010-2011 winter season, nighttime surveys employing infrared cameras and a variable width transect may be conducted when possible.

At the end of first 5 years of the long-term monitoring (September 2016), this study will have data sets from broad-scale coverage of PWS ranging from 4 to 10 years. In addition, there is data from select bays for cruises conducted between Dec 2004 and Oct 2006 including: October (1 yr), December (1 yr) and March (2 yrs).

Table 1. Total years of broad-scale PWS seabird surveys, by month. March 2007 – March 2016.

Month	Total Survey Years
October	5
November	9
December	4
January	2
February	4
March	10

C. Data Analysis and Statistical Methods

Density (birds • km^{-2}) of each seabird species will be calculated for each km of survey trackline. We will use all surveys conducted since 2007 to describe the seasonal patterns of abundance and distribution. Seabird observations will be mapped using ArcView GIS. Temporal variability in bird density will be addressed at inter- and intra-annual scales.

The November and late March/early April seabird transects will be conducted concomitant with hydroacoustic fish surveys. The November *Juvenile Herring Abundance Index* survey will take place in the four bays (Simpson, Eaglek, Zaikof, Whale) surveyed in the 1990's as part of the

EVOS-sponsored Sound Ecosystem Assessment (SEA) program. Locations of the expanded adult herring surveys are not yet defined. Data on fish biomass (kg/m2) by depth will be available for each trackline. Composition of fish schools will be made available by the *Validation of Acoustic Surveys for Pacific Herring Using Direct Capture,* a separate project that is part of the *PWS Herring Research & Monitoring* program. We will combine acoustic survey data on prey composition with a suite of additional independent variables shown to be relevant to seabird predation (eg., school density, school area, species composition and size structure, water depth, depth to school, depth below each school, and distance from shore [Kuletz 2005; Ostrand et al. 2004, 1998; Day and Nigro 2000]). We will use logistic regression to determine the role of these covariates on the presence of seabirds (Maniscalco et al. 1998; Manly et al. 1993). Model selection criteria (eg., AIC, GCV) will be chosen according to the most effective model framework (eg., GLM, GAM).

We will model seabird abundance and distribution in relation to biological and physical environmental factors. While the prey field data will be available from the *PWS Herring Research and Monitoring* cruises, seabird abundance surveys will cover both the herring and LTM humpback whale cruises. Seabird abundance data are typically zero-dominated therefore hurdle models will be applied whereby data are analysed initially as presence-absence, followed by a separate analysis of presence-only data (Boucher and Guillén, 2009, Zuur *et al*. 2009). Hence, the first analysis will determine which covariates are driving the presence and absence of birds, while the second analyses will focus on covariates driving the abundance of birds when they were present. GIS will be used to determine covariates such as distance to shore, water depth, distance to eelgrass beds, distance to kelp beds, and slope. Locations of coastal kelp and eelgrass beds will be obtained from the ShoreZone database (NOAA Fisheries 2009), and slope from the Alaska Ocean Observing System bathymetry grid. Other covariates including sea surface temperature, year, and month will also be examined. For the presence-absence data a binomial generalised additive mixed model (GAMM) will be used. For presence-only data we will use a GAMM. For a detailed description of the proposed statistical methods see Zuur *et al*. (*in press*).

Late fall and early winter plankton tows will be conducted in October and November each year in PWS as part of the *LTM Long term monitoring of oceanographic conditions in Prince William Sound.* Surveys will be conducted in the four bays (Simpson, Eaglek, Zaikof, Whale) surveyed in the 1990's as part of the EVOS-sponsored Sound Ecosystem Assessment (SEA) program. In addition, plankton surveys will include the major entrances to PWS. We will examine zooplankton data to see if there are linkages to seabird hotspots observed during October, November and December cruises.

To describe the relationship between seabird densities and zooplankton biomass and herring biomass in PWS we will run linear regressions, using zooplankton and herring survey data provided from their respective projects. For each bird species, a best model for explaining variability in bird densities will be determined using a general linear model. A natural log or square root transformation of the dependent variable will be used when appropriate to improve the fit of the model to the data. The relationship between date, densities of each seabird species observed, and food abundance (zooplankton or herring biomass) will be evaluated by bay (the four SEA bays and the four additional bays), and in the case of herring biomass, by transect.

Current seabird survey data provide little information regarding the residence times of most seabird species in Prince William Sound from November through March. Our recent efforts to quantify herring consumption by seabirds utilizes the best available data about such residency and estimates seabird consumption based on a daily energy budget projected over each species winter residency period (Bishop et al., *in prep b*). The increased temporal resolution of sampling in the current proposal will enable us to include direct observations of seabird presence throughout the season to improve upon the current data. Refined data for each species will be used to update the residence time parameter in our current consumption model, thereby improving estimates of seabird consumption of herring during winter.

D. Description of Study Area

The pelagic component of the *LTM* project, including this project and the *Humpback Whale Intensive Surveys* includes all of Prince William Sound. Seabird observations associated with the *PWS Herring Research & Monitoring Juvenile Herring Abundance Index* will focus on the four bays (Zaikof, Whale, Eaglek, and Simpson) that were extensively studied during the Sound Ecosystem Assessment study and PWS Herring Survey program (Figure 1). This allows the work to build upon the historical research completed in those bays. These bays also cover four different quadrants of the Sound. The *PWS Herring Research & Monitoring Juvenile Herring Abundance Index* and the *Expanded Adult Herring Surveys* will include other bays based on the results from the synthesis and aerial surveys, respectively.

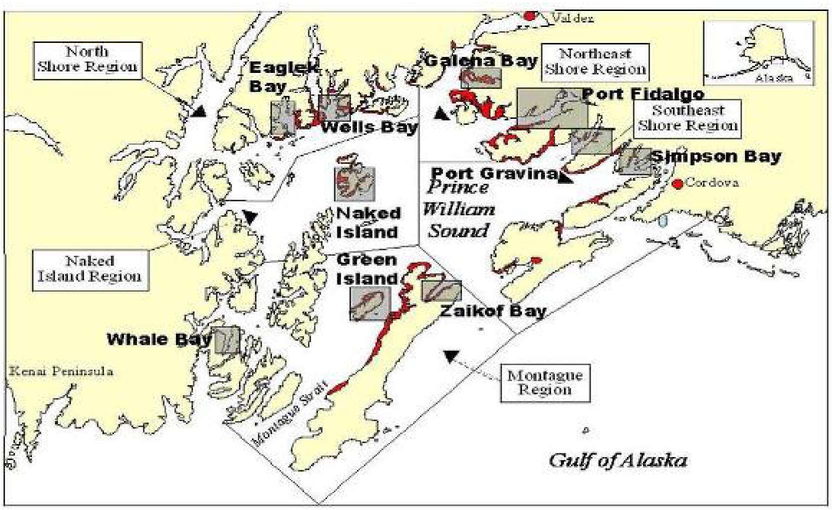


Figure 1. Study area, Prince William Sound. Hi-lighted in gray are the four SEA bays (Whale, Zaikof, Eaglek, and Simpson), as well as other bays historically important for juvenile herring.

E. Coordination and Collaboration with Other Efforts

See Above. Additional information specific to this project:

This project is a component of the integrated *Long-term Monitoring of Marine Conditions and Injured Resources and Services* submitted by McCammon et al. Our proposed long-term monitoring program is composed of several components (Environmental Drivers, Pelagic and Benthic Monitoring), with a series of projects in each component lead by principal investigators from a number of institutions. The seabird project, headed by Dr. Mary Anne Bishop, is part of the pelagic monitoring component and shares research vessels associated with the *LTM Humpback Whale Systematic Surveys*, also part of the pelagic monitoring component. In addition, this seabird project is highly integrated with the *PWS Herring Research & Monitoring* program, and shares research vessels with the two projects in this program (see below).

This project builds on previous seabird data sets. Since 2004, winter seabird surveys have been performed on vessels conducting hydroacoustic surveys for adult herring (5 cruises, 2004-2006) and juvenile herring (8 cruises, 2007 to present). Cruises since 2007 have been part of EVOS Projects 070814 and 10100132-H. In addition, seabird surveys have been performed on vessels conducting Humpback Whale surveys (6 cruises, 2007-2009) as part of EVOS project 070804.

This long-term seabird monitoring project uses as observing platforms vessels associated with three different projects. Cruises begin in Cordova, and therefore the staff member would not need to travel. One seabird observer (PWSSC staff) will be onboard all cruises associated with the *LTM Humpback Whale systematic surveys*. (Oct, Dec, Feb, years 1-4). In addition, a seabird observer (PWSSC staff) will be onboard surveys associated with *PWS Herring Research and Monitoring.* Specifically the observer will be onboard *Juvenile Herring Abundance Index* surveys (Nov yrs 2-5) and the *Expanded Adult Herring Surveys* (late March/early Apr yrs 2-5). Seabird observations from this project will be shared and integrated into the whale and herring surveys. In addition, information on herring, other fish and zooplankton prey fields around whale foraging areas, juvenile herring schools and adult herring schools will be used for the seabird analyses.

Information from this project will feed into the *North Pacific Pelagic Seabird Database,* a database that is maintained by US Fish & Wildlife Service and USGS. This databsed is currently being integrated into a single database that will be available over the internet through an ARC/IMS.

III. SCHEDULE

A. Project Milestones

Objective 1. . Characterize the spatial and temporal abundance of seabirds in PWS during late fall and winter.
Data analyses incorporating data collected through April 2016 will be completed by July 2016 and incorporated into LTM program report by August 2016.

Objective 2. Model species abundance and distribution in relation to biological and physical environmental factors
Data analyses incorporating data collected through April 2016 will be completed by July 2016 and incorporated into LTM program report by August 2016.

Objective 3. Assess seabird habitat associations within and between winters
Data analyses incorporating data collected through April 2016 will be completed by July 2016 and incorporated into LTM program by August 2016.

Objective 4. Relate species composition and distribution to prey fields.
Data analyses incorporating data collected through April 2016 will be completed by July 2016 and incorporated into LTM program report by August 2016.

Objective 5. Identify critical marine habitats used by seabirds during late fall and winter
Data analyses incorporating data collected through April 2016 will be completed by August 2016 and incorporated into LTM program report by August 2016.

B. Measurable Project Tasks

The following provides a schedule for this seabird project's monitoring activities proposed over the five-year period. Additional information on program schedules can be found in the main narrative

FY12 1st Quarter (October 1, 2011 to December 31, 2011)

November	Annual PI meeting
December	Field cruise: *LTM* humpback whale and seabird surveys

FY12 2nd Quarter

January	Alaska Marine Science Symposium
February	Field cruise: *LTM* humpback whale and seabird surveys

FY12 3rd Quarter

Apr – June	Analyze data
June	Submit FY13 work plan for review

FY12 4th Quarter

Jul - Sep	Analyze data
August	Submit annual report

FY13 1st Quarter (October 1, 2012 to December 31, 2012)

October	Field cruise: *LTM* humpback whale and seabird surveys
November	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* juvenile abundance index
November	Annual PI meeting.
December	Field cruise: *LTM* humpback whale and seabird surveys

FY13 2nd Quarter

January	Alaska Marine Science Symposium
February	Field cruise: *LTM* humpback whale and seabird surveys
late Mar/early Apr	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* extended adult biomass cruise

FY13 3rd Quarter

late Mar/early Apr	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* program extended adult biomass cruise
Apr – June	Analyze data
June	Submit FY14 work plan for review.

FY13 4th Quarter

Jul - Sep	Analyze data
August	Submit annual report

FY14 1st Quarter (October 1, 2013 to December 31, 2013)

October	Field cruise: *LTM* humpback whale and seabird surveys
November	Annual PI meeting

November	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* juvenile abundance index
December	Field cruise: *LTM* humpback whale and seabird surveys

<u>FY14 2nd Quarter</u>

January	Alaska Marine Science Symposium
February	Field cruise: *LTM* humpback whale and seabird surveys
Winter	Joint EVOS sponsored workshop: Herring & Long-term Monitoring programs
late Mar/early Apr	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* extended adult biomass cruise

<u>FY14 3rd Quarter</u>

late Mar/early Apr	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* extended adult biomass cruise
Apr – June	Analyze data
June	Submit FY15 work plan for review

<u>FY14 4th Quarter</u>

Jul - Sep	Analyze data
August	Submit annual report

<u>FY15 1st Quarter</u> (October 1, 2014 to December 31, 2014)

October	Field cruise: *LTM* humpback whale and seabird surveys
November	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* juvenile abundance index
November	Annual PI meeting
December	Field cruise: *LT*M humpback whale and seabird surveys

<u>FY15 2nd Quarter</u>

January	Alaska Marine Science Symposium
February	Field cruise: *LTM* humpback whale and seabird surveys
late Mar/early Apr	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* extended adult biomass cruise

<u>FY15 3rd Quarter</u>

late Mar/early Apr	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* extended adult biomass cruise
Apr – June	Analyze data
May	Submit five-year plan for FY17-22 and work plan for FY16

<u>FY15 4th Quarter</u>

Jul - Sep	Analyze data
August	Submit annual report

<u>FY16 1st Quarter</u> (October 1, 2015 to December 31, 2015)

November	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* juvenile abundance index

November	Annual PI meeting

<u>FY16 2nd Quarter</u>

January	Alaska Marine Science Symposium
late Mar/early Apr	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* extended adult biomass cruise

<u>FY16 3rd Quarter</u>

late Mar/early Apr	Field cruise: *LTM* seabird survey in conjunction with *PWS Herring* extended adult biomass cruise
Apr – June	Analyze data
June	Submit work plan for FY17

<u>FY16 4th Quarter</u>

Jul - Sep	Analyze data
August	Submit annual report

IV. LITERATURE CITED

Bishop, M.A., J. Watson, T. Morgan, and K.J. Kuletz. *In prep.* Pacific herring consumption by marine birds during winter in Prince William Sound, Alaska.

Bishop, M.A., T. Morgan, K. Kuletz and R. Thorne (In prep., b). Seabirds respond to predictable Pacific Herring (*Clupea pallasii)* aggregations during winter in Prince William Sound, Alaska.

Boucher, J.P. and M. Guillén. 2009. A survey on models for panel count data with applications to insurance. Revista de la Real Academia de Ciencias Exactas, Fisicas y Naturales. Serie A. Matematicas, 277-294.

Burnham, K.P., and D.R. Anderson. 2002. Model selection and multimodel inference: a practical information-theoretic approach. 2nd ed. Springer-Verlag. New York, NY.

Daunt, F., V. Afanasyev, J.R.D. Silk and S. Wanless. 2006. Extrinsic and intrinsic determinants of winter foraging and breeding phenology in a temperate seabird. Behavioural Ecology and Sociobiology 59:81-388.

Dawson, N., M.A.Bishop, K.J. Kuletz, A. Zuur. *In review.* Habitat associations of seabirds during winter in Prince William Sound, Alaska. Submitted to Ecological modeling.

Day, R.H., and D.A. Nigro. 2000. Feeding ecology of Kittlitz's and Marbled Murrelets in Prince William Sound, Alaska. Waterbirds 23:1-14

Dunn, E.K. 1973. Changes in fishing ability of terns associated with wind speed and sea surface conditions. Nature 244:520-521.

Fort, J., W.P. Porter and D. Grémillet. 2009. Thermodynamic modelling predicts energetic bottleneck for seabirds wintering in the northwest Atlantic. Journal of Experimental Biology 212: 2483-2490.

Frederiksen, M., F. Daunt, M.P. Harris and S. Wanless. 2008. The demographic impact of extreme events: stochastic weather drives survival and population dynamics in a long-lived seabird. Journal of Animal Ecology 77:1020-1029.

Harris, M.P. and S. Wanless. 1989. Fall Colony Attendance and Breeding Success in the Common Murre. Condor 91:139-146.

Kuletz, K.J. 2005. Foraging behaviour and productivity of a non-colonial seabird, the Marbled Murrelet (*Brachyramphus marmoratus*) relative to prey and habitat. Ph.D. Dissertation. University of Victoria, Victoria, British Columbia.

Maniscalco, J.M., W.D. Ostrand and K.O. Coyle. Selection of fish schools by flocking seabirds in Prince William Sound, Alaska. 1998. Colonial Waterbirds 21(3): 314-322.

Manly, F.F.J., L.L. McDonald, andD.L. Thomas. 1993. Resource selection by animals, statistical design analysis for field studies. London, England: Chapman and Hall.

NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2009. Alaska ShoreZone coastal mapping and imagery. Accessed Jan12 2010. http://wwwalaskafisheriesnoaagov/habitat/shorezone/szintrohtm

Ostrand, W.D., K.O. Coyle, G.S. Drew, J.M. Maniscalco, and D.B. Irons. 1998. Selection of forage fish schools by murrelets and tufted puffins in Prince William Sound, Alaska. Condor 100:286-297.

Parmesan, C. 2006. Ecological and evolutionary responses to recent climate change. Annu. Rev. Ecol. Syst. 37:637–669

Piatt, J.F. and T.I. Van Pelt. 1997. Mass-mortality of Guillemots *Uria aalge* in the Gulf of Alaska in 1993. Marine Pollution Bulletin 34:656-662.

Sydeman, W.J., K.L. Mills, J.A. Santora, S.A. Thompson. 2009. Seabirds and climate in the California current—a synthesis of change. CalCOFI Rep., Vol. 50:82-104.

Taylor, I.R. 1983. Effect of wind on the foraging behavior of Common and Sandwich Terns. Ornis Scandinavica 14:90-96.

USFWS 2007. North Pacific Pelagic Seabird Observer Program Observers Manual, Inshore / small vessel version, November 2007. U.S. Fish and Wildlife Service, Migratory Bird Management Nongame Program, Anchorage, Alaska. Unpublished protocol manual, 25 pages.

Zuur, A.F., E.N. Ieno, N. Walker, A.A. Saveliev and G.M. Smith. 2009. Mixed effects models and extensions in ecology. R Springer.

Zuur, A.F., N.M. Dawson, M.A. Bishop, K.J. Kuletz, A.A. Saveliev and E.N. Ieno (in press). Zero inflated Common Murre density data. *In* Zuur A.F., Saveliev A.A., Ieno E.N. (eds) Analysing Ecological Data - Practical Solutions When Things Get Complicated

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$46.0	$70.0	$72.0	$74.3	$77.3	$339.6
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$1.4	$2.1	$2.1	$2.1	$1.8	$9.5
Commodities	$0.0	$0.0	$0.1	$0.1	$0.1	$0.3
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	waived	waived	waived	waived	waived	waived
SUBTOTAL	$47.4	$72.1	$74.2	$76.5	$79.2	$349.4
General Administration (9% of subtotal)	$4.3	$6.5	$6.7	$6.9	$7.1	$31.5
PROJECT TOTAL	$51.7	$78.6	$80.9	$83.4	$86.3	$380.9
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: PWSSC waives the indirect cost on this proposal due to its administration of the overall proposal. This project is part of the *Long-Term Monitoring of Marine Conditions and Injured Resources and Services (LTM), Pelagic Monitoring Componen*t. We are using vessels of opportunity for the seabird observers. Vessel costs are in the *LTM* project *Humpback whale monitoring* and in the proposal by W.S. Pegau, *PWS Herring Research & Monitoring.*

FY12-16

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3A
NON-TRUSTEE
AGENCY SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
B. Hsu	Research Assistant	4.0	6.4		25.6
M.A. Bishop	Principal Investigator	1.9	11.0		20.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	17.4	0.0	
				Personnel Total	46.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
				Travel Total	0

FY12

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
network & software subscriptions $150/staff mo	0.9
communications (phone & fax) $50/staff mo	0.3
printing & copying $25/staff mo	0.2
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	1

Commodities Costs: Description	Commodities Sum
Commodities Total	0

FY12

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
		New Equipment Total	0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Desktop computer (2) and ruggedized computer (1)	3	PWSSC

FY12

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
B. Hsu	Research Assistant	6.5	6.6		42.9
M.A. Bishop	Principal Investigator	2.4	11.3		27.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	17.9	0.0	
				Personnel Total	70.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
				Travel Total	0

FY13

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
PERSONNEL & TRAVEL
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
network & software subscriptions $150/staff mo	1.4
communications (phone & fax) $50/staff mo	0.5
printing & copying $25/staff mo	0.2
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	2.1

Commodities Costs: Description	Commodities Sum
Commodities Total	0

FY13

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
		New Equipment Total	0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Desktop computer (2) and ruggedized computer (1)	3	PWSSC

FY13

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
B. Hsu	Research Assistant	6.5	6.8		44.2
M.A. Bishop	Principal Investigator	2.4	11.6		27.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	18.4	0.0	
				Personnel Total	72.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
				Travel Total	0

FY14

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description		Contract Sum
network & software subscriptions $150/staff mo		1.4
communications (phone & fax) $50/staff mo		0.5
printing & copying $25/staff mo		0.2
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	2.1

Commodities Costs: Description		Commodities Sum
Supplies		0.1
	Commodities Total	0.1

FY14

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
		New Equipment Total	0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Desktop computer (2) and ruggedized computer (1)	3	PWSSC

FY14

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
B. Hsu	Research Assistant	6.5	7.0		45.5
M.A. Bishop	Principal Investigator	2.4	12.0		28.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	19.0	0.0	
				Personnel Total	74.3

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
				Travel Total	0

FY15

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
network & software subscriptions $150/staff mo	1.4
communications (phone & fax) $50/staff mo	0.5
printing & copying $25/staff mo	0.2
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	2.1

Commodities Costs: Description	Commodities Sum
supplies	0.1
Commodities Total	0.1

FY15

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
		New Equipment Total	0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Desktop computer (2) and ruggedized computer (1)	3	PWSSC

FY15

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
B. Hsu	Research Assistant	4.0	7.2		28.8
M.A. Bishop	Principal Investigator	3.9	12.4		48.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	19.6	0.0	
				Personnel Total	77.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
				Travel Total	0

FY16

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
network & software subscriptions $150/staff mo	1.2
communications (phone & fax) $50/staff mo	0.4
printing & copying $25/staff mo	0.2
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	1.8

Commodities Costs: Description	Commodities Sum
Supplies	0.1
Commodities Total	0.1

FY16

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
		New Equipment Total	0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Desktop computer (2) and ruggedized computer (1)	3	PWSSC

FY16

Project Title: Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Data Management Support for the EVOSTC Long Term Monitoring Program

Project Period: FY12-FY16

Primary Investigator(s): Rob Bochenek, Alaska Ocean Observing System

Study Location: General Spill Affected Area

Abstract: This project supplies the EVOS Long Term Monitoring (LTM) effort with critical data management support to assist study teams in efficiently meeting their objectives and ensuring data produced or consolidated through the effort is organized, documented and available to be utilized by a wide array of technical and non technical users. This effort leverages, coordinates and cost shares with a series of existing data management projects which are parallel in scope to the data management needs of the long term monitoring program. In the first two years, this project would focus on providing informatics support to streamline the transfer of information between various study teams and isolate and standardize historic data sets in the general spill affected area for use in retrospective analysis, synthesis and model development. These efforts would continue into year three through five but efforts would also focus on developing management and outreach applications for the data and data products produced from the LTM program.

Estimated Budget: $750K total over 5 years without 9%GA - $817.4K with the 9%GA
EVOSTC Funding Requested:
FY12-150K, FY13-149.9K, FY14-150.4K, FY15-150.4K, FY16-149.2K without the 9% GA
FY12-163.5K, FY13-163.4K, FY14-$164K, FY15-164K, FY16-162.6K with the 9% GA
Non-EVOSTC Funds to be used:
FY12-683K, FY13-640K, FY14-620K, FY15-500K, FY16-500K

Date: 5-25-2011

PROJECT PLAN

I. NEED FOR THE PROJECT
A. Statement of Problem

In the two decades following the *Exxon Valdez* oil spill (EVOS), and after extensive restoration, research and monitoring efforts, it has been recognized that full recovery from the spill will take decades and requires long-term monitoring of both the injured resources and factors other than residual oil that may continue to inhibit recovery or adversely impact resources that have recovered. Monitoring information is valuable for assessing recovery of injured species, managing those resources and the services they provide, and informing the communities who depend on the resources. In addition, long-term, consistent, scientific data is critical to allow us to detect and understand ecosystem changes and shifts that directly or indirectly (e.g. through food web relationships) influence the species and services injured by the spill.

An integrated monitoring program requires information on environmental drivers and pelagic and benthic components of the marine ecosystem. Additionally, while extensive monitoring data has been collected thus far through EVOS Trustee Council-funded projects as well as from other sources and made publicly available, much of that information needs to be assessed holistically to understand the range of factors affecting individual species and the ecosystem as a whole. Interdisciplinary syntheses of historical and ongoing monitoring data are needed to answer remaining questions about the recovery of injured resources and impacts of ecosystem change.

Managing oceanographic data is particularly challenging due to the variety of data collection protocols and the vast range of oceanographic variables studied. Data may derive from automated real-time sensors, remote sensing satellite/observational platforms, field/cruise observations, model outputs, and various other sources. Variables can range from mesoscale ocean dynamics to microscale zooplankton counts. The resulting datasets are packaged and stored in advanced formats, and describe a wide spectrum of scientific observations and metrics. Due to the complexity of the data, developing data management strategies to securely organize and disseminate information is also technically challenging. Distilling the underlying information into usable products for various user groups requires a cohesive, end-to-end approach in addition to a fundamental understanding of the needs and requirements of the user groups and stakeholders.

Data management activities for oceanographic information occur in isolated, physically distributed agencies, leading to low cross-agency utilization of data. Technical barriers, complex data formats, a lack of standardization and missing metadata have limited access to data and made the utilization of available scientific information cumbersome and daunting. As a consequence, existing data is underutilized and often has not undergone quality assurance.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Our proposed long-term monitoring program is: 1) directly relevant to the goals and priorities for "Monitoring and Research" outlined by the EVOS Trustee Council in the 1994 EVOS Restoration Plan; 2) responds to priorities in the FY 2012 Invitation for Proposals; and 3) follows additional Council guidance including the 2010 Injured Resources and Services Update. The 1994 Restoration Plan identifies the continuing need for a sustained and interdisciplinary monitoring system to inform restoration needs and activities for injured resources and services. Specific language in the 1994 Restoration Plan cites the need for monitoring to "understand the physical and biological interactions that affect an injured resource or service, and may be constraining its recovery" (p. 25), recommends an "ecosystem approach" (p. 12), and recognizes that "an ecosystem approach to restoring injured resources and services may require restoration activities that address a resource's prey or predators, or the other biota and physical surroundings on which it depends..."(p. 13). The scientific monitoring program described below is explicitly designed to meet these priorities.

The management strategy we propose to implement for the overall long-term monitoring program is also based on priorities in the 1994 Restoration Plan. First, in that document and in ongoing guidance, the Trustee Council recognizes that there are not sufficient funds to accomplish all necessary restoration and monitoring activities and that partnerships are necessary to meet Council goals. Specifically, the plan states that "Restoration will take advantage of cost-sharing opportunities where effective" (p. 15) and "Priority shall be given to strategies that involve multi-disciplinary, interagency, or collaborative partnerships" (p. 16). Our proposed monitoring program will expand the efforts previously funded by the Trustee Council through leveraging collaborations with multiple agency monitoring programs and other research programs (such as those of the North Pacific Research Board and the Alaska Ocean Observing System), and with the Herring Program under this funding opportunity.

The 1994 Restoration Plan also included a policy that "Restoration will include a synthesis of findings and results, and will also provide an indication of important remaining issues or gaps in knowledge" (p. 16). We address this priority in our proposed science synthesis component, which includes conceptual ecological modeling, described in Section C. Effective synthesis of science data requires coordinated data management from the beginning of the monitoring program. Data management activities for ecological and physical information have been scattered among different agencies and research groups, reducing the utilization of information for integrated understanding of the ecosystem.

We are also committed to the 1994 Restoration Plan policy that "Restoration must reflect public ownership of the process by timely release and reasonable access to information and data" (p. 17). We propose to adopt a data management policy for this project that responds to this policy in a transparent and timely fashion.

Community involvement in and public outreach of monitoring results is called for under the 1994 Restoration Plan policy that "Restoration must include meaningful public participation at all levels - planning, project design, implementation and review" (p. 17). We are committed to involving local and native communities and to providing a diverse set of public outreach information and events, as outlined in Section G.

In summary, we propose a long-term monitoring program that will build on past monitoring and research efforts, leverage other initiatives and help ensure that the Trustee Council, agencies and spill-affected communities have the scientifically-based information they need to support the comprehensive, interdisciplinary recovery and rehabilitation program outlined in the 1994 EVOS Restoration Plan and subsequent EVOS Trustee Council guidance documents.

II. PROJECT DESIGN

A. Objectives

1) Provide data management oversight and services for EVOS LTM project team data centric activities which include data structure optimization, metadata generation, and transfer of data between project teams.

2) Consolidate, standardize and provide access to study area data sets that are critical for retrospective analysis, synthesis and model development.

3) Develop tools for user groups to access, analyze and visualize information produced or processed by the LTM effort.

4) Integrate all data, metadata and information products produced from this effort into the AOOS data management system for long term storage and public use.

B. Procedural and Scientific Methods

Objective 1. Provide data management oversight and services for EVOS LTM project team data centric activities which include data structure optimization, metadata generation, and transfer of data between project teams.

AOOS data management staff will work with EVOS LTM investigators to assess the types of data which will be collected during sampling efforts, assess Standard Operating Procedures (SOPs) for data collection to create metadata templates in addition to gauging general data management needs of PIs. This assessment is critical to identify the data management needs and the types of tools needed by researchers to increase their abilities to manage their data in an automated, standard fashion. Table 1 (included at the end of this proposal) details an initial effort by the AOOS data management team to assess the characteristics of each individual LTM project's data collection activities. This initial assessment has provided key details which will assist and guide investigators in developing data management plans and strategizing for the overall data management approach to the program. This exercise further validates the fact that project level data is heterogeneous in nature and is composed of a wide array of observational types requiring novel data management approaches to facilitate integration. It is clear that PIs need both flexible and powerful tools to assist them in sharing, archiving and documenting their research products.

The AOOS data management group is currently developing a web base platform for PIs to manage project level data sets and author metadata. System development is currently funded through internal AOOS funds in additional to dedicated funding from the Prince William Sound Science Center. The AOOS Ocean Workspace will provide a web based platform for PIs to post and share data sets and rapidly author metadata. The system will be enabled with security authentication in order to limit access to LTM investigators, project managers and administrators. The system will also provide PIs with tools to generate metadata profiles which comply with national standards. Initially, this system will focus on authoring FGDC metadata formats including tools for authoring the biological extension for taxonomic classifications and measurements. The software development phase of this application was initiated in March 2011. An initial beta release/testing of this system will commence in August 2011 with a planned release date of October 1^{st}, 2011. This platform will provide LTM investigators and project managers with a transparent view of data collection and metadata authoring progress in addition to providing a framework for data integration. It is envisioned that this platform will function as the primary vehicle to facilitate data transfer, metadata generation and archiving for the entire LTM project data management lifecycle. This proposed effort will provide a user base and focused environment for the expansion and refinement of this project level data management system.

Objective 2. Consolidate, standardize and provide access to study area data sets that are critical for retrospective analysis, synthesis and model development.

This task will involve isolating and standardizing historic data sets deemed necessary for retrospective analysis by EVOS LTM synthesis efforts. Early in the effort the EVOS LTM researcher team will be engaged to prioritize sources of relevant data deemed of high value for the synthesis effort. Data will be prioritized by several metrics including length of time series, scientific importance, and quality and precision of the data storage format. All data acquired through efforts of this project will be merged into the AOOS data system for long term archival and access.

Members of the LTM integrated team were surveyed to document historical data sources under their stewardship which could be of potential value to the LTM program and synthesis effort. These data resources are listed in Table 2 (included at the end of this proposal). This list will provide a starting point for consolidation/prioritization of data in preparation for synthesis efforts. Table 3 (included at the end of this proposal) provides a list which delineates the data sets researchers would be interested in getting access to but are currently unaware of any sources of data.

Many herring and PWS ecosystem data sets not easily accessible to restoration researchers and managers have been standardized and made available through the actions of the PWS Herring Portal (EVOS Project 070822, 080822 and 090822). Building upon results of the PWS Herring Portal Project, investigators will expand their efforts to additional project level data sets, long term time series produced from sensor platforms, remote sensing/satellite imagery data products, oceanographic/atmospheric/ecological model outputs and relevant GIS data layers. The AOOS data system currently has the capacity to manage all of these data types except for project level data. AOOS will be deploying a project level data management system in the fall of 2011 to address this need. This is the same system referenced in methods of objective 1. Data analysts preparing and salvaging historic project level datasets will leverage this system to consolidate, centralize and document data resources so that LTM investigators can access these data as they are discovered, processed and made available for use.

Additionally, data management staff will leverage existing data management efforts and data sets currently under the stewardship of AOOS in this activity. These resources and efforts are detailed more fully in the "Coordination and Collaboration with Other Efforts" section of this proposal. These existing data resources include a wide array of physical and biological data sets in the general spill affected areas. These resources can be accessed at http://data.aoos.org.

Objective 3. Develop tools for user groups to access, analyze and visualize information produced or processed by the LTM effort.

Working with regional agency and outreach staff develop products and management tools that are based upon data produced or acquired from EVOS LTM project activities. Effective data visualization exposes problems, manifests trends, and allows for high level comparisons with other sources of information. Data visualization products are also ideal tools to communicate information to audiences with varying degrees of familiarity in meaningful and easily understandable ways. Providing these types of high level data products allows members of all user groups to rapidly discover assess and comprehend complex data sets. These tools could include emergency response and management applications that provide users with rapid detailed access to threatened habitat, species distribution and real time ocean conditions or outreach and education products that provide users visualizations of relevant data at informational kiosks.

Investigators propose to develop web based data driven tools based upon prioritization and direction from user groups. The process will initiate in year two with the development of a user access tool work plan which will be distributed for review and feedback in May of 2013. The work plan will be finalized in October of 2013 at which time platform development will commence with a target release date of June 2014 for the first version of user data access tools. Addition release versions are planned annually in June alongside annual access tool work plan publishing for review at the Alaska Marine Science Symposium in January.

Figure 1 below provides screen captures of existing AOOS data portals which provide access to data systems that manage sensors, models/remote sensing and GIS data sets. These portals can be accessed off the AOOS website at http://data.aoos.org/.

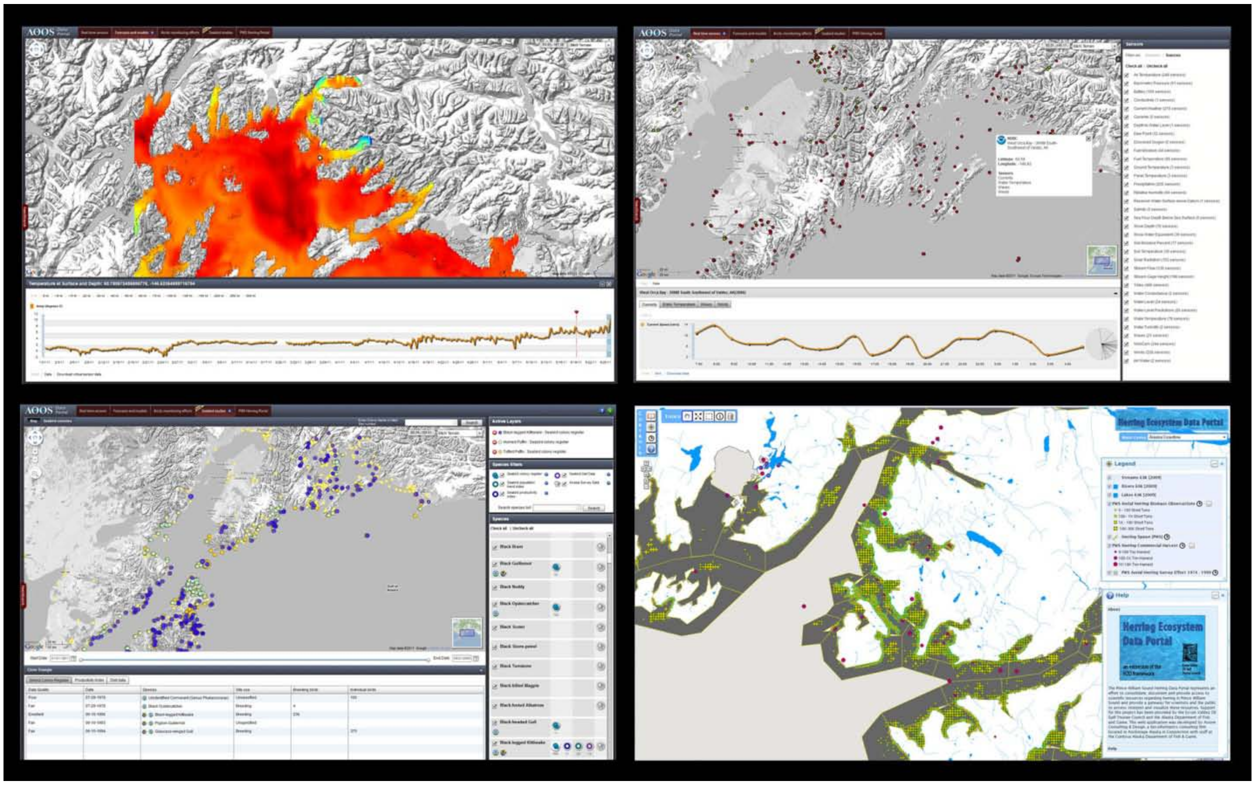


Figure 1. Screenshots of existing AOOS data management and visualization systems which are available at http://data.aoos.org. At the top left is a screenshot of the AOOS model explorer displaying a ROMS circulation model of Prince William Sound and an ocean temperature point source time series extraction near Port Fidalgo. On the top right of the figure is a screen capture of the AOOS real time sensor portal. On the bottom of the figure from the left to right are screenshots of the North Pacific Seabird Portal and the PWS Herring Portal.

Objective 4. Integrate all data, metadata and information products produced from this effort into the AOOS data management system for long term storage and public use.

The ultimate goal of this project is to provide services to assist in the organization, documentation and structuring of data collected and made available via EVOS IHRP project activities so that it can be transferred efficiently to long term data archive and storage centers and made available for future use by researchers and other user groups. This task will leverage the AOOS cyber infrastructure, long term funding and other active data management projects being undertaken by that organization. Data sets produced from the integrated research effort will be served to users by extending existing data access, analysis and visualization interfaces currently supported and under development by the AOOS data management team.

C. Data Analysis and Statistical Methods

The overarching strategic plan for the AOOS data system involves implementing an end-to-end technological solution which allows data and information to be channeled and distilled into user-friendly products while simultaneously enabling the underlying data to be assimilated and used by the emerging external data assembly systems. The following diagram (Figure 2) details the four logical technical tiers of the approach. At the base (Tier 1) of the pyramid lie the source data produced by researchers, instruments, models, and remote sensing platforms which are stored as files or loaded within geospatial databases. Interoperability systems (Tier 2), such as Web Map Services (WMS) and Web Coverage Services (WCS), are then implemented and connected to these underlying data sources. The asset catalogue (Tier 3) connects to internal interoperability systems in addition to known external sources of interoperable data and populates a database describing the dimensional characteristics (space, time, measured parameter, and taxonomy) of each data resource. Also in this third tier are web services which provide access to the descriptive information contained in the asset catalogue database so that applications can more easily utilize data from multiple sources, formats, and types. The final technical level (Tier 4) is composed of the web based applications and tools which provide users access to data and products. Users sit at the top of the pyramid with all underlying systems working together to create a powerful and intuitive user experience. The intended result is the facilitation of rapid data discovery, improved data access, understanding, and the development of knowledge about the physical and biological marine environment.

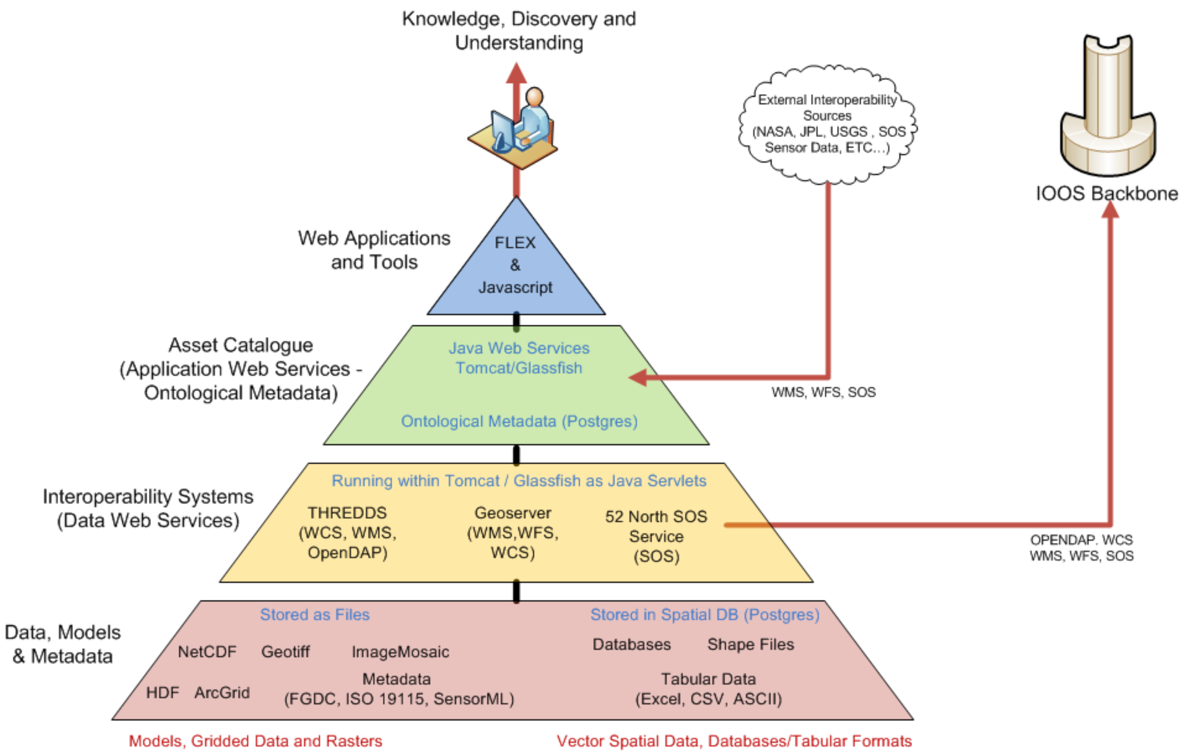


Figure 2. Data knowledge pyramid detailing the flow of data through logical technology tiers so that it can be consumed by users to enable discovery and understanding about the ocean environment.

Tiers are discussed in technical detail below.

- **Tier 1 (Data, Models and Metadata) –** At the base of the proposed data management framework are the datasets, metadata, and model outputs that provide the foundation for applications and user tools. These resources can be stored either in native formats or spatially enabled databases. The decision to choose one method over the other is dictated by the requirements of the interoperability system which will be serving the data. Data which has a tabular or vector form (Shapefiles, databases, Excel spreadsheets, comma separated values (CSV) text files, etc.) will be loaded into a PostgreSQL database and spatially indexed. GeoServer, an open source geospatial data server, will then connect to the PostgreSQL database and serve the data via WFS and WMS protocols. Imagery, raster, and model data will be stored in a file server in their native file formats. THREDDS and/or ncWMS will be used to serve NetCDF and HDF files which may contain two, three, four or higher dimensional gridded datasets. GeoServer or other OGC compliant mapping servers will be utilized to serve GeoTIFF, ArcGrid, ImageMosaic and other two dimensional imagery/raster data.

- **Tier 2 (Interoperability Systems) –** Various interoperability servers (GeoServer, THREDDS, ncWMS, 52 North SOS, etc.) will be implemented on top of source data. By design, these servers will expose a powerful set of interfaces for other computing systems and humans to extract, query, and visualize the underlying source data. These systems will facilitate all aspects of data delivery to users in addition to providing the muscle for the machine-to-machine data transfer to national data assembly systems as required. Because these systems have been developed using the Java programming language, they will run within a servlet container such as Tomcat or Glassfish.

- **Tier 3 (Asset Catalogue, Ontological Metadata and Services) –** The asset catalogue provides a description of known internal and external available data resources, access protocols for these resources (interoperability services, raw file download, etc.), and directives on how to ultimately utilize these data resources in applications. Because documentation and access methods vary widely between data sources, a system which catalogs data sources and reconciles these inconsistencies must be implemented if the data are to be used in an efficient manner.

  In addition to managing information about data availability and access methods, the asset catalogue will also contain an ontology that maps source data descriptions and metadata to a common set of internally stored terms with strict definitions. This mapping will allow users to easily locate related sets of information without having explicit knowledge of the internal naming conventions of each data-providing agency. The development of an internal ontology will also enable future endeavors to connect the asset catalogue to global ontologies in the semantic web. The following dimensions are to be stored in the database for mapping the heterogeneous characteristics of source data to common metrics:

  - **Source –** Service URLs and methods of interaction for these services.
  - **Data formats and return types –** Data format returned by the service and how data can be equated between various formats.
  - **Space (x, y, z) –** Spatial dimensions of dataset (1D, 2D, 3D). Upper and lower spatial bounds (bounding box or cube) stored in common projection (EPSG 4326).

- **Time (t) –** For data resources with a time component: document time span, whether time corresponds to a single moment or if it is representative of a time period. If data is in discrete periods, document individual available periods.
- **Taxonomy –** Taxonomic data mapped to International Taxonomic Information System (ITIS) codes.
- **Parameter –** Parameter(s) and units in the data resource and how they map to internally defined universal terms. For example: Datasets SST, AVHRR, and Sea_Surface all contain parameters that map to internal universal term Sea Surface Temperature.

Web services written in the Java programming language will be developed to connect to the asset catalogue and provide applications with access to the underlying descriptions of all known data sources. Because the asset catalogue contains a structured ontological definition of data sources and maps all known data sources to a common definition, applications can be developed which connect users to vast arrays of data through simple but powerful interfaces. The following is a list of example functionality that is possible utilizing this methodology:

- Users can load multiple data layers (potentially existing in different physical locations and being served by different systems) onto a single web based map. Users can also filter all layers simultaneously by time or request spatial and temporal subsamples of data that can be pulled from multiple sources and automatically packaged into a single download.
- All real time sensor feeds can be accessed and visualized on a single uniform user interface by parameter even though the sources of the sensor feeds may exist in a wide array of formats and service protocols.
- Users can query the asset catalogue to discover which data is available for an area, time period, parameter, and species.

- **Tier 4 (User Applications) –** Users interface with web based applications that bring together combinations of underlying data and allow users to make discoveries, improve understanding, and develop knowledge through visualization and data access. These types of applications would most likely be interactive map based data portals. Applications will also be developed which provide specific targeted functionality. These focused applications could include marine spatial planning tools, emergency response applications, and educational/outreach portals. Developed tools are designed to meet user needs and thus require user input into their initial design and periodic feedback to direct functional improvements for future design iterations.

D. Description of Study Area

The majority of this project will involve consolidating existing data, metadata, and other electronic resources related to herring in Spill Affected Area. Specific areas of focus include those areas in PWS, Lower Cook Inlet, and Kodiak where herring fisheries currently do, or historically did occur. The north, east, south, and west bounding coordinates of this area are 59.767, -145.837, 61.834, and -154.334

E. Coordination and Collaboration with Other Efforts

This proposal is part of the integrated "Long-Term Monitoring of Marine Conditions and Injured Resources and Services" proposal submitted by the Prince William Sound Science Center to the Exxon Valdez Oil Spill Trustee Council. It includes the collaboration and coordination described there for work within the herring research group and with the Long-Term Monitoring PWS Herring Research and Monitoring proposal submitted by the Alaska Ocean Observing System. This project is also highly coupled with the proposed data management component of the EVOS Herring Research and Monitoring program.

AOOS brings a significant level of leveraged resources, infrastructure, regional data management projects and partnerships to this proposed effort. The data management effort for the LTM and herring projects could not be accomplished for the budgeted amount by a team without these leveraged resources.

1. AOOS – (500k to AOOS DM) Alaska oceanographic data management effort. Supports open source, standards based data system that serves up and archives real-time sensor feeds, models & remote sensing data, GIS data layers, and historical datasets. Data system developed on interoperability concepts and meets NOAA Integrated Ocean Observing System standards and protocols for streaming data feeds to national data assimilation centers. Data Management Committee chaired by Dr. Phil Mundy provides ongoing advice, prioritization and direction to the team at Axiom Consulting & Design. AOOS board is made up of federal and state agencies, and major marine research institutions in the state that have committed to data sharing. The AOOS board has committed to supporting a statewide data system for as long as AOOS exists. Federal funding is stable, although we would like to see it increase. In the event AOOS was to end, all data and data products would be transferred to the University of Alaska.
2. PWSSC – PWSSC Data Management Project ($50K to AOOS DM).– Project involves the creation of a prototype data management system for use by PWSSC staff to manage, track, document via metadata and visualize oceanographic and biological data being collected at the center. Project will utilize a stack of open source technologies and protocols with the overall goal of creating a packaged solution for research organizations to better manage and document their data resources. This project is to function as the pilot application for the AOOS project level data management system (Ocean Workbench).
3. Northern Forum/USFWS Seabird Data System – ($50K)Project involves the creation and population of a series of new seabird metric databases (diet and productivity) and integrating these new databases with legacy seabird databases (species distribution and abundance at seabird colonies, pelagic species distribution and abundance, USGS seabird monitoring databases and NPRB's North Pacific Seabird Diet Database). Modern spatially explicit, web based data entry interfaces have and continue to be developed to assist researchers existing in distributed agencies to contribute their historic and current seabird metric data into standard data structures. Project will result in vastly increasing

the amount and quality of seabird species distribution, diet and other seabird data available for use in retrospective analysis and management. Though data includes areas around all of Alaska, most available data is located in GOA and PWS.

4. AOOS – 3-year funded partnership (~$200K to ADF&G) with ADF&G Division of Commercial Fisheries to develop data sharing and transfer to make commercial fisheries data more accessible, and to allow ADF&G researchers greater access to oceanographic data. Project builds upon an effort funded by the Moore foundation to develop improved data management capacity and salmon fishery management tools for the PWS fisheries.
5. AOOS – collaborator with Alaska Data Integration Working Group – an initiative with the Alaska Climate Change Executive Roundtable – to develop protocols for serving up project data to increase data sharing among federal and state agencies.
6. AOOS and NOAA – initiatives to develop data sharing agreements with private sector, including oil & gas companies.
7. Cook Inlet Regional Citizens Advisory Council (27K) – contract with Axiom to develop a data management system for their oceanographic and contaminants data in Cook Inlet.

III. SCHEDULE

A. Project Milestones

Objective 1. Provide data management oversight and services for EVOS LTM project team data centric activities which include data structure optimization, metadata generation, and transfer of data between project teams.

This objective will be addressed throughout the entire span of the project and will follow the annual cycle of field data collection and analysis by principal investigators. Investigators will be engaged before each field season to ensure that preparations have been made to stage data collected by the project so that other members of the LTM project can access the data produced by project participants.

Objective 2. Consolidate, standardize and provide access to study area data sets that are critical for retrospective analysis, synthesis and model development.

This objective will be met by the fourth quarter of year two of the effort (September 2013).

Objective 3. Develop tools for user groups to access, analyze and visualize information produced or processed by the LTM effort.

Initial release of version 1 of the user access tool platform will take place in Quarter three of year three (June 2014). Version 2 and 3 of the user tool platform will be released June 2015 and June 2016 respectively.

Objective 4. Integrate all data, metadata and information products produced from this effort into the AOOS data management system for long term storage and public use.

This objective will be addressed throughout the entire span of the project. The AOOS data system is to serve as the vessel to capture all project level data produced through this effort in addition to those datasets salvaged to inform the historic synthesis effort. This task will be ongoing as long as the program is producing or acquiring additional data.

B. Measurable Project Tasks

FY12 1st Quarter (October 1, 11 to December 31, 11)

October	Project authorized by trustee council
October	Release AOOS Ocean Workbench (Project DM System)
November	Set up user profiles for PIs in Ocean Workbench
November	Initialize historic data aggregation effort
December	Draft historic data set manifest

FY12 2nd Quarter

January	Annual Marine Science Symposium
January	Prioritize historic datasets for inclusion into synthesis effort
February	Adjust historic data aggregation effort and AOOS integration

FY12 3rd Quarter

April	Prepare for FY12 field season
May	Participate in annual PI meeting
June	Submit FY13 work plan for review

FY12 4th Quarter

August	Submit annual report

FY13 1st Quarter (October 1, 12 to December 31, 12)

October	Assess/Validate year 1 datasets and metadata submitted through Ocean Workbench

FY13 2nd Quarter

January	Annual Marine Science Symposium
January	Release updated Ocean Workbench tool

FY13 3rd Quarter

May	Draft user access tool work plan version 1
May	Participate annual PI meeting
June	Submit FY14 work plan for review
June	Complete integration of data salvaged into AOOS DM System

FY13 4th Quarter

August	Submit annual report

FY14 1st Quarter (October 1, 13 to December 31, 13)

October	Assess year 2 datasets and metadata submitted through Ocean Workbench
October	Finalize user access tool work plan version 1 and initiate development

FY14 2nd Quarter

January	Annual Marine Science Symposium
January	Release updated Ocean Workbench tool
Winter	EVOS workshop with Herring and Long-term monitoring programs

FY14 3rd Quarter

May	Participate in annual PI meeting
June	Submit FY15 work plan for review
June	Release version 1 of user tool platform

FY14 4th Quarter

August	Submit annual report

FY15 1st Quarter (October 1, 14 to December 31, 14)

October	Assess year 3 datasets and metadata submitted through Ocean Workbench
October	Compile feedback from user access tool platform version 1.

FY15 2nd Quarter

January	Annual Marine Science Symposium
January	Finalize user access tool work plan version 2, initiate development
January	Release updated Ocean Workbench tool

FY15 3rd Quarter

May	Participate in annual PI meeting
May	Submit five-year plan for FY17-22 and work plan for FY16
June	Release version 2 of user tool platform

FY15 4th Quarter

FY16 1st Quarter (October 1, 15 to December 31, 15)

October	Assess year 4 datasets and metadata submitted through Ocean Workbench
October	Compile feedback from user access tool platform version 2.

FY16 2nd Quarter

January	Annual Marine Science Symposium
January	Release updated Ocean Workbench tool
January	Finalize user access tool work plan version 3, initiate development

FY16 3rd Quarter

June	Submit work plan for FY17
June	Release version 3 of user tool platform

FY16 4th Quarter

August	Submit annual report

Table 1. LTM project level data manifest for planned research/sampling efforts.

Team Member	**LTM or IHRP**	**Data Set Name**	**Description/Parameters Collected**	**Collection Location**	**Frequency/Collection Period**	**Storage Formats**	**Size (KB, MB, GB)?**
Sonia Batten	LTM	Continuous Plankton Recorder data	Mesozooplankton and larger phytoplankton near surface abundances with taxonomic resolution	transect from Cook Inlet to open ocean	6 times per year, monthly between about March and September. Collected over 1-2 days	Samples stored in an archive. Data stored in spreadshe	less than 1 MB per year

						ets	
Mary Anne Bishop	LTM	Seabird Monitoring	species, number, activity, gis location, time, date, weather	throughout Prince William Sound	~1x month, Oct - March, beginning 2011	text files, excel, access database	access databa se ~1gb when comple te
Rob Campbell	LTM and IHRP	PWS plankton	Plankton taxonomy (surface sample)	12 stations throughout PWS (SEA bays, Entrances, central PWS)	6 times/year, focus on spring and autumn blooms	flat file	KB
Rob Campbell	LTM and IHRP	PWS nutrients	Nitrate, Phosphate, Silicate (six near surface depths)	12 stations throughout PWS (SEA bays, Entrances, central PWS)	6 times/year, focus on spring and autumn blooms	flat file	KB
Rob Campbell	LTM and IHRP	PWS Hydrograph y	Pressure, Temperature, Salinity	12 stations throughout PWS (SEA bays, Entrances, central PWS)	6 times/year, focus on spring and autumn blooms	flat file	KB
Rob Campbell	LTM and IHRP	PWS biogeochemi stry	Submisible Ultraviolet Nitrate Analyser (SUNA) nitrate concentration, In situ fluorescence, In situ backscatter turbidity	12 stations throughout PWS (SEA bays, Entrances, central PWS)	6 times/year, focus on spring and autumn blooms	flat file	KB
Rob Campbell	LTM	PWS high frequency mooring	Pressure, Temperature, Salinity, Submisible Ultraviolet Nitrate Analyser (SUNA) nitrate concentration, In situ fluorescence, In situ backscatter turbidity	Central PWS (approximate site of CFOS buoy deployed in the 1990's)	Daily	Electronic , near real-time, direct to Data Managem ent Group database)	MB
Brenda Ballachey	LTM	Sea otter aerial survey	aerial surveys used to calculate sea otter abundance	PWS, Katmai, Kenai Fjords, Kachemak Bay	every 3 years in Katmai, Kenai Fjords, and Kachemak Bay, annual for WPWS	GIS files, .pdf reports generated from ArcPad	MB
Brenda Ballachey	LTM	Sea otter forage	forage data collected to calculate energy recovery rates, species size and composition	PWS, Katmai, Kenai Fjords, Kachemak Bay	annual	excel	MB
Brenda Ballachey	LTM	Sea otter carcass	collected to determine age-at-death; includes carcass location, condition, sex if it can be detemined, age at death; skulls are collected, cleaned and stored	PWS, Katmai, Kenai Fjords, Kachemak Bay	annual	excel	MB

Brenda Ballachey	LTM	Soft sediment inverts	clam density, size distribution and species composition	PWS, Katmai, Kenai Fjords, Kachemak Bay	every 2 years	excel	MB
Brenda Ballachey	LTM	percent cover for various algae and invertebrates - rocky sediment	random point counts collected to calculate percent cover of dominant algae and large sessile invertebrates	PWS, Katmai, Kenai Fjords, Kachemak Bay	annual	excel / Access	MB
Brenda Ballachey	LTM	sea star density - rocky sediments	sea star density and species distribution	PWS, Katmai, Kenai Fjords, Kachemak Bay	annual	excel	MB
Brenda Ballachey	LTM	Nucella/Katharina density - rocky sediments	Nucella and Katherina density along rocky sediment substrates	PWS, Katmai, Kenai Fjords, Kachemak Bay	annual	excel	MB
Brenda Ballachey	LTM	limpet size distribution - rocky sediments	L. persona size distribution along rocky sediment substrates	PWS, Katmai, Kenai Fjords, Kachemak Bay	annual	excel	MB
Brenda Ballachey	LTM	Temperature	temperature collected every 30min. - 1 hour at the 0 MLLW tidal elevation at various rocky sediment sites	PWS, Katmai, Kenai Fjords, Kachemak Bay	annual	HOBO Onset proprietary software,	MB
Brenda Ballachey	LTM	Salinity	salinity collected every hour at the 0 MLLW tidal elevation at various rocky sediment sites	PWS, Katmai, Kenai Fjords	annual	StarOdi proprietary software,	MB
Brenda Ballachey	LTM	Mussel density	Mussel density of all size classes as well as density of mussels > 19mm collected at mussel bed sites	PWS, Katmai, Kenai Fjords, Kachemak Bay	annual	excel	MB
Brenda Ballachey	LTM	Mussel size distribution	Mussel size distribution of mussels > 19mm collected at mussel bed sites	PWS, Katmai, Kenai Fjords, Kachemak Bay	annual	excel	MB
Brenda Ballachey	LTM	Eelgrass percent cover	Presence/absence of eelgrass bed data collected using sonar for a set of random transects within a bed	PWS, Katmai, Kenai Fjords	annual	excel	MB
Brenda Ballachey	LTM	marine bird and mammal nearshore surveys	density and distribution collected along nearshore transects	Katmai, Kenai Fjords	annual	Can be excel if that is what fits best for import into larger data structure	MB
Brenda Ballachey	LTM	black oystercatcher nest density	active nest density along 20 km transects	PWS, Katmai, Kenai Fjords	annual	excel	MB

Brenda Ballachey	LTM	black oystercatcher diet	size distribution and species composition of prey brought back to the nest to provision chicks	PWS, Katmai, Kenai Fjords	annual	excel	MB
Brenda Ballachey	LTM	contaminants	trace metals, organics (PAH, PCB, OC) in mussels; includes grain size of sediments collected concurrently with mussels	PWS	one time, scheduled for 2012	excel	MB
Brenda Ballachey	LTM	Mussels - stable isotopes	stable isotopes in mussel tissue; n of isotopes to be determined	PWS	annual	excel	MB
John Moran	LTM	Humpback Whale Fluke ID	Fluke photographs, counts of whales, Location, behavior, prey type	PWS	3 - 6 day surveys/winter	Access database	GB
David Irons					Every two years/ summer, every three years/winter	access database, North Pacific Pelagic Seabird Database	< 10 GB per survey
Mark Carls					Annual, probably < 100 samples + lingering oil time series every 5 years	Excel, Access	mb to gb
John Piatt	LTM	sample station log	randomly selected grid locations, time, date, transect distance, geographic and topographic parameters (distance to shore, distance to pour points, distance to tidewater glacier, bottom depth, etc,)	PWS (possibly also Katmai, Cook Inlet, Kachemak Bay)	Annual, July	Access	< 100 KB
John Piatt	LTM	hydroacoustics (sample = transect)	depth-integrated biomass (1 x 100 m cell resolution), nearshore fine-scale bathymetric features, GIS	PWS (possibly also Katmai, Cook Inlet, Kachemak Bay)	Annual, July	Access	2-5 GB
John Piatt	LTM	trawl catch and morphometrics (sample = station)	fish CPUE by species (number of fish/km towed, gelatinous zooplankton and euphausiid biomass/km towed); fish length-weight by species; euphausiid weights, counts per volume by species;	PWS (possibly also Katmai, Cook Inlet, Kachemak Bay)	Annual, July	Access	< 5 MB
John Piatt	LTM	seabird and marine mammal survey (sample = transect)	observation conditions, predator GIS locations and group size by transect	PWS (possibly also Katmai, Cook Inlet, Kachemak Bay)	Annual, July	Access	< 5 MB

John Piatt	LTM	zooplankton (sample = station)	zooplankton abundance and biomass by species	PWS (possibly also Katmai, Cook Inlet, Kachemak Bay)	Annual, July	Access	< 1 MB
John Piatt	LTM	CTD (sample = station)	temperature, conductivity, depth, fluorescence, beam transmission, photosynthetically active radiation, oxygen concentration	PWS (possibly also Katmai, Cook Inlet, Kachemak Bay)	Annual, July	Access	< 5 MB
John Piatt	LTM	Chlorophyll a (sample = station)	acetone extracted chlorophyll a concentration, pheopigment ratio	PWS (possibly also Katmai, Cook Inlet, Kachemak Bay)	Annual, July	Access	< 100 KB
John Piatt	LTM	nutrients (sample = station)	NO_2, NO_3, NH_4, $Si(OH)_4$, PO_4 concentration (µM)	PWS (possibly also Katmai, Cook Inlet, Kachemak Bay)	Annual, July	Access	< 100 KB
Tom Weingartner	LTM	GAK 1 moored time series	Temperature, salinity, pressure	59° 50.7' N, 149° 28.0' W, Waater depth = 263 m	15 minutes - year-round	ASCII	1-2MB
Tom Weingartner	LTM	GAk 1 monthly CTD vertical profiles	Temperature, salinity, pressure	59° 50.7' N, 149° 28.0' W, Waater depth = 263 m	10 times per year	ASCII	0.5 MB
Russ Hopcroft	LTM	Seward Line Chlorophyll	total extarcted chlorophyll	Northern Gulf fo Alaska, Prince William Sound	Surveys twice annually	File by year as Excel and CSV	KBs per year
Russ Hopcroft	LTM	Seward Line Nutrients	Nitrate, ammonia, phosphate, silicate	Northern Gulf fo Alaska, Prince William Sound	Surveys twice annually	File by year as Excel and CSV	KBs per year
Russ Hopcroft	LTM	Seward Line CTD	temperature, salinity, fluorescence profiles	Northern Gulf fo Alaska, Prince William Sound	Surveys twice annually	File by year as Excel and CSV	MBs per year
Russ Hopcroft	LTM	Seward Line meszooplankton	species composition, abundance and biomass	Northern Gulf fo Alaska, Prince William Sound	Surveys twice annually	File by year as Excel and CSV	MBs per year
Russ Hopcroft	LTM	Seawrd Line Carbonate chemistry	Ocean pH and satuation states	Northern Gulf fo Alaska, Prince William Sound	Surveys twice annually	File by year as Excel and CSV	KBs per year
Craig Matkin	LTM	Annual photographic census of killer whales	Photographs of individual killer whales/pods/groups	Prince William Sound/Kenai Fjords	Annual	Individual digital photos	10GB

Craig Matkin	LTM	Annually updated catalogue of individuals	ID number/Date of birth/geneology of individual KWs	Prince William Sound/Kenai Fjords	Annual	Digital catalogue	50MB
Craig Matkin	LTM	Annual photographic census summary by pod/group	Individuals/pods in each encounter	Prince William Sound/Kenai Fjords	Annual	Digital spread sheets	2MB
Craig Matkin	LTM	Annual summary of biopsy results	Animals biopsied/date/time/location/haplotype	Prince William Sound/Kenai Fjords	Annual	Digital spread sheet	1MB
Craig Matkin	LTM	Annual summary of tag attachments	Animals tagged/date/time/location /other data	Prince William Sound/Kenai Fjords	Annual	Digital spread sheet	1MB
Craig Matkin	LTM	Annual Survey/Encounter summaries	Details of each survey day and each encounter	Prince William Sound/Kenai Fjords	Annual	Access database	15MB
Angela Doroff	LTM	Zooplankton	Plankton (surface sample)	Multiple stations throughout LCI and KB	4 times/year, focus on spring and autumn blooms; monthly for inner KB	Access	GB
Angela Doroff	LTM	KB Nutrients	ammonium, nitrate + nitrite, orthophosphate, and chlorophyll-a	2 stations in KB; surface and deep sampling at Homer and Seldovia harbors	Nutrient monitoring will occur at the SWMP datalogger stations for monthly baseline grab samples (consisting of two replicates) and monthly diel samples will be collected at the Homer Harbor station	Access	GB
Angela Doroff	LTM	KB Hydrography	Pressure/depth, Temperature, Salinity, DO, turbitity, pH	2 stations in KB; surface and deep sampling at Homer and Seldovia harbors	Standard SWMP water quality data will be collected at four stations every 15 minutes. Sondes will be regularly deployed, retrieved, calibrated, and maintained	Access	GB
Angela Doroff	LTM	KB Meteorological Station	air temp, relative humitity, barometric pressure, wind (speed & direction), PAR, total solar radiation, precipitation	2 stations in KB (Homer Spit and Anchor Point)	Weather data will be collected every 15 minutes according to the standard SWMP protocols	Access	GB
Angela Doroff	LTM	CTD (sample = station)	temperature, conductivity, depth, fluorescence, beam transmission, photosynthetically active radiation, oxygen	LCI and KB	Quarterly	Access	< 5 MB

			concentration				

Table 2. Known and available historic data sets voiced by LTM PIs to be of potential value to LTM project.

Team member	Data Set Name	Description/Parameters Collected	Frequency/Collection Period	Storage Formats	Size (KB, MB, GB)?	Location
Sonia Batten	Continuous Plankton Recorder data	Mesozooplankton and larger phytoplankton near surface abundances with taxonomic resolution	monthly between about March and September, 2000-2011	spreadsheets	<2 MB	Gulf of Alaska, Cook Inlet
Mary Anne Bishop	Seabird Predation on Herring	species, number, activity, gis location, time, date, weather	Nov and March; 2007-2011; Jan 08 & 09, Sept 08, Oct 08,	text files, excel, access database	DB= 525 mb; other files = ~100mb	Prince William Sound Science Center
Mary Anne Bishop	ShoreZone	various		raster files		NOAA web site & PWS Science Ctr has copy
Brenda Ballachey	Master site location for rocky / soft / mussel	locations (lat/lons) for all rocky and soft sediment sites as well as mussel beds	measurements taken once during initial site set-up	excel . GIS files	MB	WPWS, Kenai Fjords, Katmai
Brenda Ballachey	Rocky site slope	slope measurements taken at initial site visit	measurements taken once during initial site set-up	excel	MB	WPWS, Kenai Fjords, Katmai
Brenda Ballachey	Eelgrass sonar track (d-log)	locations (lat/lons) for all eelgrass bed sampling including track logs	measurements taken annually during eelgrass sampling	excel . GIS files	MB	WPWS, Kenai Fjords, Katmai
Brenda Ballachey	Sea otter aerial survey	aerial surveys used to calculate sea otter abundance	every 3 years in Katmai and Kenai Fjords, annually in WPWS	GIS files, .pdf reports generated from Arc Pad	MB	WPWS, Kenai Fjords, Katmai, some data for Kachemak Bay
Brenda Ballachey	Sea otter forage	forage data collected to calculate energy recovery rates, species size and composition	annually	excel	MB	WPWS, Kenai Fjords, Katmai, some data for Kachemak Bay
Brenda Ballachey	Sea otter carcass	collected to determine age-at-death; includes carcass location, condition, sex if it can be detemined, age at death; skulls are collected, cleaned and stored	annually	excel	MB	WPWS, Kenai Fjords, Katmai, some data for

						Kachemak Bay
Brenda Ballachey	Soft sediment inverts	clam density, size distribution and species composition	every 2 years	excel	MB	WPWS, Kenai Fjords, Katmai, some data for Kachemak Bay
Brenda Ballachey	percent cover for various algae and invertebrates - rocky sediment	random point counts collected to calculate percent cover of dominant algae and large sessile invertebrates	annually	excel / Access	MB	WPWS, Kenai Fjords, Katmai, Kachemak Bay
Brenda Ballachey	sea star density - rocky sediments	sea star density and species distribution	annually	excel	MB	WPWS, Kenai Fjords, Katmai, Kachemak Bay
Brenda Ballachey	Nucella/Katharina density - rocky sediments	Nucella and Katherina density along rocky sediment substrates	annually	excel	MB	WPWS, Kenai Fjords, Katmai, Kachemak Bay
Brenda Ballachey	limpet size distribution - rocky sediments	L. persona size distribution along rocky sediment substrates	annually	excel	MB	WPWS, Kenai Fjords, Katmai
Brenda Ballachey	Temperature	temperature collected every 30min. - 1 hour at the 0 MLLW tidal elevation at various rocky sediment sites	annually	HOBO Onset proprietary software	MB	WPWS, Kenai Fjords, Katmai, some data for Kachemak Bay
Brenda Ballachey	Salinity	salinity collected every hour at the 0 MLLW tidal elevation at various rocky sediment sites	annually	StarOdi proprietary software	MB	WPWS, Kenai Fjords, Katmai, some data for Kachemak Bay
Brenda Ballachey	Mussel density	Mussel density of all size classes as well as density of mussels > 19mm collected at mussel bed sites	annually	excel	MB	WPWS, Kenai Fjords, Katmai, some data for Kachemak Bay

Brenda Ballachey	Mussel size distribution	Mussel size distribution of mussels > 19mm collected at mussel bed sites	annually	excel	MB	WPWS, Kenai Fjords, Katmai
Brenda Ballachey	Eelgrass percent cover	Presence/absence of eelgrass bed data collected using sonar for a set of random transects within a bed	annually	excel	MB	WPWS, Kenai Fjords, Katmai, some data for Kachemak Bay
Brenda Ballachey	marine bird and mammal nearshore surveys	density and distribution collected along nearshore transects	annually	Can be excel if that is what fits best for import into larger data structure	MB	Kenai Fjords, Katmai, some data for Kachemak Bay
Brenda Ballachey	black oystercatcher nest density	active nest density along 20 km transects	annually	excel	MB	WPWS, Kenai Fjords, Katmai
Brenda Ballachey	black oystercatcher diet	size distribution and species composition of prey brought back to the nest to provision chicks	annually	excel	MB	WPWS, Kenai Fjords, Katmai
Brenda Ballachey	contaminants	trace metals, organics (PAH, PCB, OC) in mussels; includes grain size of sediment samples collected concurrently with mussels	one time	excel	MB	Katmai, Kenai Fjords
John Moran	Humpback Whale Fluke ID from EVOSTC Project 100804	Fluke photographs, counts of whales, Location, behavior, prey type	Fall/Winter 2007-2009	Access	GB	PWS
David Irons	North Pacific Pelagic Seabird Database	birds/km2, sea surface variables, weather	every 2 to 3 years from 1989 to 2010	access database	< 50GB	USGS Anchorage, Gary Drew contact
Mark Carls	ABLHCD	naphthalene through benzo(ghi)perylene (currently 44 PAH compounds) + C9 through C36 alkanes (n=30), including pristane and phytane. Some analyses also include biomarkers (triterpanes, hopanes, and steranes; n = 51)	1989 through present	Access database.	about 10 gb	ABL, Carls, Larsen
John Piatt	Herring Assessment data (ADFG, PWSCC, NOAA)	forage fish bycatch data, hydroacoustic data, energetics, stable isotope, zooplankton	1994-2011 (ongoing, annual)	Excel		PWS
John Piatt	Areial forage fish surveys	schools, species, locations	1995-1999 (SEA, APEX), 2010-13 (PWS Herring Survey)	excel		PWS

John Piatt	Forage fish biomass data	hydroacoustic survey data	1997-1999 (APEX)	Excel		PWS
John Piatt	Forage fish size data	fish morphometrics (length weight by species)	1997-1999 (APEX)	Excel		PWS
John Piatt	Proximate composition of forage fish	lipid, protein, energy density	Oct-Nov 1995	Excel		PWS
John Piatt	ADFG large mesh trawl surveys	forage fish bycatch data	1999-2009 (ongoing, biennial)	Excel		PWS
Russ Hopcroft	Seward Line Chlorophyll	total extarcted chlorophyll	1998-2004 frequency was 4-7 times per year, twice per year 2005-2011	File by year as Excel and CSV	KBs per year	UAF, NPRB, WHOI, NODC
Russ Hopcroft	Seward Line Nutrients	Nitrate, ammonia, phosphate, silicate	1998-2004 frequency was 4-7 times per year, twice per year 2005-2011	File by year as Excel and CSV	KBs per year	UAF, NPRB, WHOI, NODC
Russ Hopcroft	Seward Line CTD	temperature, salinity, fluorescence profiles	1998-2004 frequency was 4-7 times per year, twice per year 2005-2011	File by year as Excel and CSV	MBs per year	UAF, NPRB, WHOI, NODC
Russ Hopcroft	Seward Line meszooplank ton	species composition, abundance and biomass	1998-2004 frequency was 4-7 times per year, twice per year 2005-2011	File by year as Excel and CSV	MBs per year	UAF, NPRB, WHOI, NODC
Russ Hopcroft	Seward Line Carbonate chemistry	Ocean pH and satuation states	twice annually 2009-2011	File by year as Excel and CSV	MBs per year	UAF
Craig Matkin	Annual photographic census of killer whales	Photographs of individual killer whales/pods/groups	Annually since 1984 (film negative format until 2010)	Digital since 2010	20GB plus negative s	Pacific Biologica l Station, Nanaimo BC and NGOS, Homer, Alaska
Craig Matkin	Annually updated catalogue of individuals	ID number/Date of birth/geneology of individual KWs	Annually since 1984	Digital since 2000	Current 50MB	NGOS, Homer, AK
Craig Matkin	Annual photographic census summary by pod/group	Individuals/pods in each encounter	Annually since 1984	Digital spread sheets	10MB	NGOS, Homer, AK
Craig Matkin	Annual summary of biopsy results	Animals biopsied/date/time/location/haploty pe	Annually since 1994	Digital spread sheets	1MB	NGOS, Homer, AK

Craig Matkin	Annual summary of tag attachments	Animals tagged/date/time/location/other data	Annually since 2006	Digital spread sheets	1MB	NGOS, Homer, AK
Craig Matkin	Annual Survey/Encounter summaries	Details of each survey day and each encounter	Annually since 2002 (prior years in non digital formats	Acess data base, data sheets prior to 2002	50MB and data sheets	NGOS, Homer, AK
Angela Doroff	KB Nutrients	ammonium, nitrate + nitrite, orthophosphate, and chlorophyll-a	2 stations in KB; surface and deep sampling at Homer and Seldovia harbors	monthly baseline grab samples	Access	KB
Angela Doroff	KB Hydrography	Pressure/depth, Temperature, Salinity, DO, turbitity, pH	2 stations in KB; surface and deep sampling at Homer and Seldovia harbors	collected at four stations every 15 minutes.	Access	KB
Angela Doroff	KB Meteorological Station	air temp, relative humitity, barometric pressure, wind (speed & direction), PAR, total solar radiation, precipitation	2 stations in KB (Homer Spit and Anchor Point)	collected every 15 minutes	Access	KB
Angela Doroff	CTD (multiple transects)	temperature, conductivity, depth, fluorescence, beam transmission, photosynthetically active radiation, oxygen concentration	LCI and KB			

Table 3. LTM project data requests/needs as voiced by PIs.

Team Member	**Data Type**	**Ideal Time Period**	**Ideal Location**
Mary Anne Bishop	hydroacoustic fish surveys	in conjunction w Humpback Whale Cruises	Prince William Sound
Mary Anne Bishop	zooplankton sampling	in conjunction w Humpback Whale Cruises	Prince William Sound
Mary Anne Bishop	CTD sampling	in conjunction w Humpback Whale Cruises	Prince William Sound
Mary Anne Bishop	Seabird Diet Sampling (lethal collections)	Oct - March	Prince William Sound
Brenda Ballachey	aerial photos of eelgrass and kelp bed	summer low tides	WPWS, Katmai and Kenai Fjords, Kachemak Bay
Brenda Ballachey	GOA oceanographic data: environmental, chlor a, nutrients, plankton	annual/seasonal	WPWS, Katmai and Kenai Fjords, Kachemak Bay
Brenda Ballachey	forage fish	annual/seasonal	WPWS, Katmai and Kenai Fjords, Kachemak Bay

John Moran	Forage fish euphausiid distributions	Sesonally form fall 2011- spring 2015	Thoughout PWS
John Moran	Opportunistic Whale observations	Year-round	PWS
David Irons	Forage fish abundance and distribution	overlap with our surveys, summer	PWS -s ound-wide
David Irons	water column characteristics	overlap with our surveys, summer	PWS -s ound-wide
David Irons	SST and SSS	overlap with our surveys, summer	PWS -s ound-wide
Russ Hopcroft	CTD casts - SEA program	1990 onward	PWS
Russ Hopcroft	Mooring records	1990 onward	PWS entances
Angela Doroff	GOA oceanographic data: environmental, chlor a, nutrients, plankton	annual/seasonal	WPWS, Katmai and Kenai Fjords, Kachemak Bay
Angela Doroff	PWS, GOA, plankton	Plankton taxonomy (surface sample)	All PWS, GOA, LCI, & KB
Angela Doroff	Sea otter aerial survey	aerial surveys used to calculate sea otter abundance	PWS, Katmai, Kenai Fjords, Kachemak Bay
Angela Doroff	Sea otter forage	forage data collected to calculate energy recovery rates, species size and composition	PWS, Katmai, Kenai Fjords, Kachemak Bay
Angela Doroff	Soft sediment inverts	clam density, size distribution and species composition	PWS, Katmai, Kenai Fjords, Kachemak Bay
Angela Doroff	percent cover for various algae and invertebrates - rocky sediment	random point counts collected to calculate percent cover of dominant algae and large sessile invertebrates	PWS, Katmai, Kenai Fjords, Kachemak Bay
Angela Doroff	sea star density - rocky sediments	sea star density and species distribution	PWS, Katmai, Kenai Fjords, Kachemak Bay
Angela Doroff	Nucella/Katharina density - rocky sediments	Nucella and Katherina density along rocky sediment substrates	PWS, Katmai, Kenai Fjords, Kachemak Bay
Angela Doroff	limpet size distribution - rocky sediments	L. persona size distribution along rocky sediment substrates	PWS, Katmai, Kenai Fjords, Kachemak Bay
Angela Doroff	Mussel density	Mussel density of all size classes as well as density of mussels > 19mm collected at mussel bed sites	PWS, Katmai, Kenai Fjords, Kachemak Bay
Angela Doroff	Mussel size distribution	Mussel size distribution of mussels > 19mm collected at mussel bed sites	PWS, Katmai, Kenai Fjords, Kachemak Bay

BUDGET JUSTIFICATION: Fiscal Year: 2012

Personnel:
Funds are requested ($117.8K) to support a Senior Software Engineer (2 months), Software Engineer (3.0 months), Information Architect (1 month), and two Data Analysts (9 months total) in the AOOS data management unit. The software Engineers and Information Architect will supervise and direct data processing activities of the data analysts. These lead staff members will also assists in developing data management plans for projects and support the AOOS Ocean Workbench project level data management system. The data analysts will focus their activities on acquiring, accessing, documenting and loading data sets produced by or deemed important to the LTM effort into the AOOS data system for use in synthesis efforts.

Equipment:
A disk array will be procured (5.1K) in FY12 to increase storage capacity of the AOOS data system.

Indirect:
AOOS's indirect Rate is 23% (27.1 K) and has been figured into the AOOS budget. This covers expenses for software, telecommunications and other operating expenses.

BUDGET JUSTIFICATION: Fiscal Year: 2013

Personnel:
Funds are requested ($118.0K) to support a Senior Software Engineer (1.5 months), Information Architect (1 month), software engineer (3 months) and two data analysts (9 months total) in the AOOS data management unit. The Senior Software Engineer and Information Architect will supervise and direct data processing activities of the data analysts and data system development of the software engineer. These lead staff members will also assists in developing data management plans for projects. The data analyst will focus activities on acquiring, accessing, documenting and loading data sets deemed important to the LTM effort into the AOOS data system for use in synthesis. The software engineer will work developing web based pathways (extend the AOOS Ocean Workspace) for data sharing, discovery and visualization by researchers and others.

Equipment:
Compute capacity will be procured ($4.8K) in FY13 to increase storage capacity of the AOOS data system.

Indirect:
AOOS's indirect Rate is 23% ($27.1 K) and has been figured into the AOOS budget. This covers expenses for software, telecommunications and other operating expenses.

BUDGET JUSTIFICATION: Fiscal Year: 2014

Personnel:
Funds are requested ($122.3K) to support a Senior Software Engineer (1.5 months), Information Architect (1 month), two Software Engineers (5 months total) and a data analyst for (7 months total) in the AOOS data management unit. The Senior Software Engineer and Information Architect will supervise and direct data processing activities of the data analyst and data system development of the software engineers. These lead staff members will also assists in developing

data management plans for projects. The data analyst will focus activities on acquiring, accessing, documenting and loading data sets deemed important to the LTM effort into the AOOS data system for use in synthesis. The software engineers will work developing web based pathways (extend the AOOS Ocean Workspace) for data sharing, discovery and visualization by researchers and others.

Indirect:
AOOS's indirect Rate is 23% ($28.1 K) and has been figured into the AOOS budget. This covers expenses for software, telecommunications and other operating expenses.

BUDGET JUSTIFICATION: Fiscal Year: 2015

Personnel:
Funds are requested ($122.3K) to support a Senior Software Engineer (1.5 months), Information Architect (1 month), two Software Engineers (4.5 months total) and a data analyst for (7 months total) in the AOOS data management unit. The Senior Software Engineer and Information Architect will supervise and direct data processing activities of the data analyst and data system development of the software engineers. These lead staff members will also assists in developing data management plans for projects. The data analyst will focus activities on acquiring, accessing, documenting and loading data sets deemed important to the LTM effort into the AOOS data system for use in synthesis. The software engineers will work developing web based pathways (extend the AOOS Ocean Workspace) for data sharing, discovery and visualization by researchers and others.

Indirect:
AOOS's indirect Rate is 23% ($28.1 K) and has been figured into the AOOS budget. This covers expenses for software, telecommunications and other operating expenses.

BUDGET JUSTIFICATION: Fiscal Year: 2016

Personnel:
Funds are requested ($121.3K) to support a Senior Software Engineer (1.5 months), Information Architect (0.5 month), two Software Engineers (4.5 months total) and a data analyst for (7 months total) in the AOOS data management unit. The Senior Software Engineer and Information Architect will supervise and direct data processing activities of the data analyst and data system development of the software engineers. These lead staff members will also assists in developing data management plans for projects. The data analyst will focus activities on acquiring, accessing, documenting and loading data sets deemed important to the LTM effort into the AOOS data system for use in synthesis. The software engineers will work developing web based pathways (extend the AOOS Ocean Workspace) for data sharing, discovery and visualization by researchers and others.

Indirect:
AOOS's indirect Rate is 23% (27.9 K) and has been figured into the AOOS budget. This covers expenses for software, telecommunications and other operating expenses.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$117.8	$118.0	$122.3	$122.3	$121.3	$601.7
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Equipment	$5.1	$4.8	$0.0	$0.0	$0.0	$9.9
Indirect Costs (*will vary by proposer*)	$27.1	$27.1	$28.1	$28.1	$27.9	$138.4
SUBTOTAL	$150.0	$149.9	$150.4	$150.4	$149.2	$749.9
General Administration (9% of subtotal)	$13.5	$13.5	$13.5	$13.5	$13.4	$67.5
PROJECT TOTAL	$163.5	$163.4	$164.0	$164.0	$162.6	$817.4
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

Levraged Funding Sources
AOOS - Data management Activities (FY12 - 500K, FY13 - 500K, FY14 - 500K, FY15 - 500K, FY16 - 500k)
PWSSC -Project level data management system (FY12 - 48K)
Northern Forum/USFWS - North Pacific Seabird Data System (FY12 - 50K, FY13 - 50K, FY14 -50K)
ADF&G/AOOS - Data integration partnership/sharing (FY12 - 60K, FY13 - 90K, FY14 -70K)
CIRCAC - Regional Data Management Support for CI (FY12 - 25K)

FY12-16

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$117.8	$118.0	$122.3	$122.3	$121.3	$601.7
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Equipment	$5.1	$4.8	$0.0	$0.0	$0.0	$9.9
Indirect Costs (*will vary by proposer*)	$27.1	$27.1	$28.1	$28.1	$27.9	$138.4
SUBTOTAL	$150.0	$149.9	$150.4	$150.4	$149.2	$749.9
General Administration (9% of subtotal)	$13.5	$13.5	$13.5	$13.5	$13.4	$67.5
PROJECT TOTAL	$163.5	$163.4	$164.0	$164.0	$162.6	$817.4
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

Levraged Funding Sources
AOOS - Data management Activities (FY12 - 500K, FY13 - 500K, FY14 - 500K, FY15 - 500K, FY16 - 500k)
PWSSC -Project level data management system (FY12 - 48K)
Northern Forum/USFWS - North Pacific Seabird Data System (FY12 - 50K, FY13 - 50K, FY14 -50K)
ADF&G/AOOS - Data integration partnership/sharing (FY12 - 60K, FY13 - 90K, FY14 -70K)
CIRCAC - Regional Data Management Support for CI (FY12 - 25K)

FY12-16

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3A
NON-TRUSTEE
AGENCY SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
Shane StClair	Senior Software Engineer		2.0	8.4		16.8
Rob Bochenek	Infortmation Architect		1.0	9.2		9.2
Vacant	Data Analyst		7.0	7.6		53.2
Vacant	Software Engineer/		2.0	7.6		15.2
Ross Martin	Software Engineer/		3.0	7.8		23.4
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	40.6	0.0	
					Personnel Total	$117.8

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY12

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY12

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Stoarge Expansion for AOOS Disk Array	1.0	5.1	5.1
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$5.1

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
Shane StClair	Senior Software Engineer		1.5	8.7		13.1
Rob Bochenek	Infortmation Architect		1.0	9.5		9.5
Vacant	Data Analyst		7.0	7.9		55.3
Vacant	Data Analyst		2.0	7.9		15.8
Ross Martin	Software Engineer/		3.0	8.1		24.3
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	42.1	0.0	
					Personnel Total	$118.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY13

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY13

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Server for hosting LTM data and products	1.0	4.8	4.8
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
New Equipment Total			$4.8

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
Shane StClair	Senior Software Engineer		1.5	9.0		13.5
Rob Bochenek	Infortmation Architect		1.0	9.8		9.8
Vacant	Data Analyst		7.0	8.2		57.4
Vacant	Software Engineer		2.0	8.2		16.4
Ross Martin	Software Engineer		3.0	8.4		25.2
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	43.6	0.0	
					Personnel Total	$122.3

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY14

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY14

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
Shane StClair	Senior Software Engineer		1.5	9.3		14.0
Rob Bochenek	Infortmation Architect		1.0	10.1		10.1
Vacant	Data Analyst		7.0	8.5		59.5
Vacant	Software Engineer/		2.0	8.5		17.0
Ross Martin	Software Engineer/		2.5	8.7		21.8
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	45.1	0.0	
					Personnel Total	$122.3

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY15

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY15

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
Shane StClair	Senior Software Engineer		1.5	9.6		14.4
Rob Bochenek	Infortmation Architect		0.5	10.4		5.2
Vacant	Data Analyst		7.0	8.8		61.6
Vacant	Software Engineer/		2.0	8.8		17.6
Ross Martin	Software Engineer/		2.5	9.0		22.5
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	46.6	0.0	
					Personnel Total	$121.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY16

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY16

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
EQUIPMENT DETAIL

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long term monitoring: Environmental drivers component – Long-term monitoring of oceanographic conditions in Prince William Sound.

Project Period: October 1, 2012 – September 30, 2016

Primary Investigator(s): Robert Campbell, PWS Science Center – rcampbell@pwssc.org

Study Location: Prince William Sound (throughout the Sound)

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al. This project is intended to provide physical and biological measurements that may be used to assess bottom-up impacts on the marine ecosystems of Prince William Sound. Specifically, it is proposed to deploy an autonomous profiling mooring in central Prince William Sound that will provide high frequency (~daily) depth-specific measurements of physical (temperature, salinity, turbidity), biogeochemical (nitrate, phosphate and silicate) and biological (Chlorophyll-*a* concentration) parameters that will be telemetered out in near real-time. Several regular vessel surveys are also proposed to provide ground-truth data for the mooring, and to attempt to capture some of the spatial variability in PWS. As well as the mooring site, the surveys will visit all four of the SEA bays to maintain ongoing EVOSTC funded time series measurements at those sites and to support proposed herring research (Pegau et. al). The major entrances (Hinchinbrook Entrance and Montague Strait) will also be visited. The surveys will make the same suite of measurements as the mooring, and will also collect water and plankton samples. This project will also link significantly with the herring research efforts proposed by Pegau et al., and will analyze plankton samples collected during intensive studies of juvenile herring feeding and energetics.

Estimated Budget: $955.6 ($K) without 9%GA; $1,041.6K total including the 9%GA
EVOSTC Funding Requested: *Note these include the 9%GA*

FY12	FY13	FY14	FY15	FY16
$238.1	$193.2	$197.3	$203.7	$209.3

Non-EVOSTC Funds to be used: Total of $116.5K

FY12	FY13	FY14	FY15	FY16
$23K	$23K	$23K	$23K	$23K

Date: May 25, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Justification

Marine ecosystems are not static over time, they may change gradually from year to year or shift abruptly; those changes are in part driven by bottom up factors, such as environmental changes (e.g. temperature, salinity, turbidity), and biogeochemical interactions (the availability and recycling of nutrients). Long term monitoring of the spill-effected area is important, both in order to assess the recovery of resources, and to understand how the ecosystem is changing over time.

The ecosystems of the PWS region are influenced by physical environmental factors: metabolic and other vital rates for lower trophic species are generally temperature controlled, and water column production is ultimately limited by the amount of nitrogen made available to primary producers each year. Nitrogen availability is influenced by stratification (i.e. the onset of a seasonal thermocline or halocline) and mixing processes. These physical factors vary in space and in time, with different locations having different drivers (e.g. tidewater glaciers vs riverine estuaries, watersheds of varying size), and those parameters also change both inter- and intra-annually. Superimposed over all those changes in the physical environment are myriad changes in the marine ecosystem, both in terms of the constituents (who is there) and abundance (how many there are, or their biomass). The phenology of ecosystem components (the timing of who appears) is also important, particularly with regards to matches and mismatches between predators and prey.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

.

Project objectives

The goal of this program is to deliver a monitoring program that will return useful information on temporal and spatial changes in the marine environment, at a reasonable cost, and with a reasonable amount of effort. The data should be depth-specific (because water column stability is important to ecosystem productivity), of high enough frequency to capture timing changes (changes that occur on order of weeks), and give an idea of spatial variability in the region. As well, given that PWS herring will remain a funding priority of the EVOSTC in the next 20 years, any long term monitoring efforts should be integrated with future herring studies as well as building upon ongoing work funded by the trustee council. Specific objectives include:

1. Install and maintain an autonomous profiling mooring in PWS that will measure daily profiles of temperature, salinity, chlorophyll-a (as a proxy for phytoplankton biomass), turbidity and nitrate concentration in the surface layer (0-100 m).
2. Conduct regular surveys in PWS to tie in spatial variability to the high frequency time series provided by the mooring.

3. Support continued herring research by maintaining the existing time series (hydrography, plankton and nutrients) at the four SEA bays, and participating in intensive process studies of juvenile herring overwintering.

Project integration

This project links directly with the herring research program submitted separately to the Trustee Council by Scott Pegau et al, it will provide a bottom up context for the proposed work on juvenile herring. This project also links materially with the Lower Cook Inlet/Kachemak Bay long term monitoring effort: plankton and nutrient samples collected under that program will be analyzed at PWSSC by this project.

Leveraging

This program will collaborate closely with the Alaska Ocean Observing System, which has funded some prior surveys in PWS, and is currently funding oceanographic and ecosystem modeling in the region. A proposal was submitted in October 2010 for FY11-15 activities, which included thermosalinograph cruises in PWS that are complementary to the work proposed here. Some of the instrumentation and equipment used in this project was initially purchased with AOOS funds.

B. Procedural and Scientific Methods

Project approach and logistics

The central PWS mooring (Objective 1) is best located near Naked Island (Figure 1). The proposed site is the location of the C-LAB buoy deployed during the SEA project, is slightly to the west of an existing sampling station in the central sound (the current station is between tanker lanes, not a good location for a mooring) and co-located with a Seward Line sampling site (see Hopcroft project proposal). The proposed mooring is an Autonomous Moored Profiler (AMP, WetLabs, Inc.). The AMP is self-contained, and is capable of profiling from 100 m to the surface, with multiple deployments per day and a longevity of approximately 4 months (the system is battery powered, so there will be a tradeoff between the number of casts and longevity). The instrument payload on the AMP includes a CTD (0.01 ^{o}C, 0.001 S m^{-1} and 0.005 psi resolution), a fluorometer/turbidometer (0.01 µg l^{-1} chl-a and 0.01 NTU resolution), and a UV nitrate analyzer (a Satlantic SUNA: 2 µM resolution); data will be telemetered out in near real-time by cellular modem.

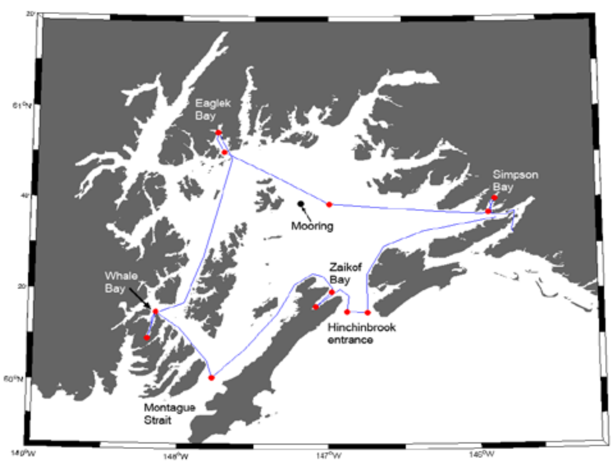


Figure 1. Proposed mooring location, cruise track and station locations visited during vessel surveys.

Vessel surveys (Objective 2) will be conducted 6 times per year, and will visit the four SEA bays that have been a focus of prior EVOSTC funded research (and a focus of the Pegau et al. herring proposal), as well as Hinchinbrook Entrance and Montague Strait (as requested by the RFP), and central PWS (to collect ground-truth data and to service the mooring). Each station will include a

CTD cast (with the same instrumentation as on the mooring), water bottles for nutrient and chl-a analysis, and a plankton tow. Two stations will be done in each of the bays, one near the head where juvenile herring are more frequently encountered, and one in more open waters at the mouth of the bay where older age classes are more common. The timing of the surveys will be structured around the "productivity season" to attempt to capture the spring and autumn blooms (i.e. pre-bloom, bloom and post-bloom). The data collected during the surveys (particularly phytoplankton abundance and nutrient concentrations) will be compared to the high frequency record in the central sound, in order to assess how the timing and magnitude of production events in the bays differs from the open waters of PWS. Stage composition of the copepod species collected by the plankton net will also give information on annual changes in phenology.

The Pegau et al. herring program is also proposing to do a number of focused process studies in the four SEA bays (Objective 3), and will provide plankton samples to be analyzed. Not all plankton is of equal quality as food to herring, and the plankton data will inform work done on herring feeding and energetics. Hydrographic, nutrient and plankton sampling will also be done during intensive overwintering juvenile surveys done by members of the Pegau et. al herring program in Simpson Bay and Port Gravina.

Methods

All of the instruments will be calibrated annually, and water samples will be taken with Niskin bottles to validate the observations. Water will be filtered through a Whatman GF/F filter (nominal pore size 0.7µm), which will be retained for the extraction of chlorophyll-*a* (Parsons et al. 1984), and the filtrate will be retained for the analysis of nitrate, phosphate and silicate. Following each cruise, quality assurance checks will be made on all the data collected, and the CTD data will be processed with standard methods; the data and associated metadata will be databased for later analysis and distribution. Zooplankton samples will be subsampled with a Folsom plankton splitter (McEwan et al. 1954), and identified to species and stage under a stereomicroscope.

C. Data Analysis and Statistical Methods

This program will result in a high frequency (~daily) time series in central PWS that will be directly comparable to a complimentary time series taken during the SEA project. It will also continue time series observations of temperature, salinity, chlorophyll fluorescence, turbidity, and nitrate concentration, all as a function of depth, at two locations in each of the SEA bays, as well as four sites representative of open water habitat and water entering and leaving PWS. Those data will be used to create temporal sections, using standard methods (e.g. Sandwell 1987; Chatfield 1995), which will then be used to describe the changes in oceanographic conditions over time within each of the bays, as well as PWS in general. Comparisons will also be made to previous observations (e.g. Meunch and Schmidt 1975; Gay and Vaughan 2001). Autocorrelation statistics such as the Mantel test (Smouse et al 1986) will be used to infer decorrelation scales between bays and the open PWS, both spatially between sites and temporally within sites.

The zooplankton collections will also provide a time series of plankton concentrations in each of the bays, in the central sound, and in the entrances and exits, although it will be depth-integrated instead of depth-specific. Differences in the concentrations of each species among the bays and open water sites will be examined with multivariate statistical methods, including hierarchical clustering and nonmetric dimensional scaling (Manly 1994). The association between plankton species and environmental parameters will also be examined with ordination techniques, including Principle Components Analysis and Redundancy Analysis (Legendre and Gallagher 2001; Clarke et al 2008).

The data will also be used to refine conceptual models of ecosystem-level production processes in PWS (Cooney et al., 2001), and the results of several years of data collection will permit inferences about how the oceanographic climate influences the biological productivity in the nearshore and offshore waters of PWS. Data on plankton taxonomy and abundance, combined with measurements of gut contents done during the intensive herring studies proposed by Scott Pegau et al. will permit testing of hypotheses about the potential for food limitation of juvenile herring in PWS.

D. Description of Study Area

This project will be conducted throughout PWS, the stations are shown in figure 1 and table 1.

Table 1: Station locations

Station	Latitude	Longitude
Simpson Bay head	60.67	-145.87
Simpson Bay mouth	60.61	-145.93
Hinchinbrook Entrance East	60.25	-146.73
Hinchinbrook Entrance West	60.25	-146.89
Zaikof Bay head	60.27	-147.09
Zaikof Bay mouth	60.34	-146.96
Montague Strait	60.01	-147.77
Whale Bay head	60.15	-148.21
Whale Bay mouth	60.23	-148.17
Eaglek Bay head	60.93	-147.74
Eaglek Bay mouth	60.85	-147.71
Central PWS (station & mooring)	60.67	-147.17

E. Coordination and Collaboration with Other Efforts

Please see Project Integration and Leveraging sections above.

III. SCHEDULE

A. Project Milestones

Objective 1. Install and maintain an autonomous profiling mooring in PWS.
The instruments and mooring equipment will be purchased in 2011/early 2012, with the intention of installing the mooring in Spring 2012.

Objective 2. Conduct regular surveys in PWS.
Cruises will be done as part of ongoing EVOSTC project 10100132-A ("PWS Herring Survey: Plankton and Oceanographic Observations") to the end of FY12,

it is proposed that they will continue under this program from FY13 onward (i.e. met by September, 2015).

Objective 3. Support continued herring research by maintaining the existing time series (hydrography, plankton and nutrients) at the four SEA bays, and participating in intensive process studies of juvenile herring overwintering.
Time series work is described above. The intensive process studies will be completed by September 2013.

B. Measurable Project Tasks

FFY 12, 1st quarter (October 1, 2012-December 31, 2012)

November:	*Project funding approved by Trustee Council*
December:	*Order mooring components and nutrient analyzer*

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)

January:	*Order mooring components*
February-March:	*Assemble mooring*

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)

April:	*Install mooring*
May:	*Mooring operational, integrate telemetry into Data Management system.*

FFY 12, 4th quarter (July 1, 2012-September 30, 2012)

July-September:	*Mooring and nutrient analyzer operational.*
July:	*Service mooring*
August:	*Submit annual report*

FFY 13, 1st quarter (October 1, 2013-December 31, 2013)

October-December:	*Mooring operational, sample processing ongoing*
October:	*Vessel survey/service mooring; herring process study cruise*
November:	*Vessel survey; herring process study cruise*
December:	*Vessel survey; herring process study cruise*

FFY 13, 2nd quarter (January 1, 2013-March 31, 2013)

January-March	*Mooring operational*
January:	*Annual Marine Science Symposium; herring process study cruise*
February:	*Herring process study cruise*
March:	*Vessel survey/service mooring; herring process study cruise*

FFY 13, 3rd quarter (April 1, 2013-June 30, 2013)

April-June:	*Mooring operational, sample processing ongoing*
April:	*Vessel survey*
June:	*Vessel survey/service mooring*

FFY 13, 4th quarter (July 1, 2013-September 30, 2013)

July-September:	*Mooring operational, sample processing ongoing*
July:	*Service mooring*
August:	*Submit annual report*

FFY 14, 1st quarter (October 1, 2014-December 31, 2014)

October-December:	*Mooring operational, sample processing ongoing*
October:	*Vessel survey/service mooring*
November:	*Vessel survey*
December:	*Vessel survey*

FFY 14, 2nd quarter (January 1, 2014-March 31, 2014)

January-March	*Mooring operational, sample processing ongoing*
January:	*Annual Marine Science Symposium*
March:	*Vessel survey/service mooring*

FFY 14, 3rd quarter (April 1, 2014-June 30, 2014)

April-June:	*Mooring operational, sample processing ongoing*
April:	*Vessel survey*
June:	*Vessel survey/service mooring*

FFY 14, 4th quarter (July 1, 2014-September 30, 2014)

July-September:	*Mooring operational, sample processing ongoing*
July:	*Service mooring*
August:	*Submit annual report*

FFY 15, 1st quarter (October 1, 2015-December 31, 2015)

October-December:	*Mooring operational, sample processing ongoing*
October:	*Vessel survey/service mooring*
November:	*Vessel survey*
December:	*Vessel survey*

FFY 15, 2nd quarter (January 1, 2015-March 31, 2015)

January-March	*Mooring operational, sample processing ongoing*
January:	*Annual Marine Science Symposium*
March:	*Vessel survey/service mooring*

FFY 15, 3rd quarter (April 1, 2015-June 30, 2015)

April-June:	*Mooring operational, sample processing ongoing*
April:	*Vessel survey*
June:	*Vessel survey/service mooring*

FFY 15, 4th quarter (July 1, 2015-September 30, 2015)

July-September:	*Mooring operational, sample processing ongoing*
July:	*Service mooring*
August:	*Submit annual report*

FFY 16, 1st quarter (October 1, 2016-December 31, 2016)

October-December:	*Mooring operational, sample processing ongoing*
October:	*Vessel survey/service mooring*
November:	*Vessel survey*
December:	*Vessel survey*

FFY 16, 2nd quarter (January 1, 2016-March 31, 2016)

January-March	*Mooring operational, sample processing ongoing*
January:	*Annual Marine Science Symposium*
March:	*Vessel survey/service mooring*

FFY 16, 3rd quarter (April 1, 2016-June 30, 2016)

April-June:	*Mooring operational, sample processing ongoing*
April:	*Vessel survey*
	Submit draft final report
June:	*Vessel survey/service mooring*
	Reply to peer reviews

FFY 16, 4th quarter (July 1, 2016-September 30, 2016)

July-September:	*Mooring operational, sample processing ongoing*
July:	*Service mooring*
	Final acceptance of final report
September	*Publication of final report complete, delivered to ARLIS*

Literature Cited:

Chatfield, C. 1989. The analysis of time series (4th ed.).Chapman & Hall, London. 241pp.

Cooney, R.T., Coyle, K.O., Stockmar, E. and C. Stark. 2001b. Seasonality in surface-layer net zooplankton communities in Prince William Sound, Alaska. Fisheries Oceanography. **10(Suppl. 1):**97-109.

Gay., S.M. and S.L. Vaughan. 2001. Seasonal hydrography and tidal currents of bays and fjords in Prince William Sound, Alaska. Fisheries Oceanography. **10(Suppl. 1):**159-193.

Legendre, P. and E.D. Gallagher. 2001. Ecologically meaningful transformations for ordination of species data. Oecologia. **129:**271-280.

Manley, B.F.J. 1994. Multivariate Statistical Methods (2nd ed.). Chapman & Hall, London. 215 pp.

McEwen, G.F., Johnson M.W. and T.R. Folsom. 1954. A statistical analysis of the performance of the Folsom plankton sample splitter, based upon test observations. Archiv fur Meteorologie, Geophysik und Bioklimatologie A **6:**502-527.

Meunch, R.D. and C.M. Schmidt. 1975. Variations in the hydrographic structure of Prince William Sound. IMS/Sea Grant Report R75-1. University of Alaska Institute of Marine Science, Fairbanks.

Parsons, T.R., Y.Maita and C.M. Lalli. 1984. A manual of biological and chemical methods for seawater analysis. Pergamon Press, Oxford. 173 pp.

Sandwell, D.T. 1987. Biharmonic Spline Interpolation of GEOS-3 and SEASAT Altimeter Data. Geophysical Research Letters **2:**139-142.

Smouse, P.E., J.C. Long, and R.R. Sokal. 1986. Multiple regression and correlation extensions of the Mantel test of matrix correspondence. Systemic Zoology. **35:** 627-632.

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$12.4	$121.6	$125.4	$131.2	$136.3	$526.8
Travel	$0.0	$1.0	$1.0	$1.0	$1.0	$4.0
Contractual	$1.0	$43.7	$43.7	$43.7	$43.7	$175.8
Commodities	$0.0	$11.0	$11.0	$11.0	$11.0	$44.0
Equipment	$205.0	$0.0	$0.0	$0.0	$0.0	$205.0
Indirect Costs (*will vary by proposer*)	waived	waived	waived	waived	waived	waived
SUBTOTAL	$218.4	$177.3	$181.1	$186.9	$192.0	$955.6
General Administration (9% of subtotal)	$19.7	$16.0	$16.3	$16.8	$17.3	$86.0
PROJECT TOTAL	$238.1	$193.2	$197.3	$203.7	$209.3	$1,041.6
Other Resources (Cost Share Funds)	$23.3	$23.3	$23.3	$23.3	$23.3	$116.5

COMMENTS: The Science Center waives Indirect Costs for this project due to its administration of the overall proposal. The Science Center will contribute all field sampling gear including a CTD, chlorophyll fluorometer, transmissometer, Submersible Ultraviolet Nitrate Analyser, plankton net, ropes, cables and sampling bottles. The field equipment has a replacement value of on order of $50,000. The Science Center will also contribute a Turner designs fluorometer for the analysis of chlorophyll, and assorted laboratory glassware, with an approximate replacement value of $20,000. For the purposes of cost share calcuations, the annual cost is estimated at 1/3 of the replacement cost.

FY12-16

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3A
NON-TRUSTEE AGENCY
SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months Budgeted	Monthly Costs	Overtime	Personnel Sum
Name	Project Title				
Technician TBD	Field/lab technician	2.0	6.2		12.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	6.2	0.0	
				Personnel Total	$12.4

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY12

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Shipping	1.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$1.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY12

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Mooring (Instruments, profiler, assorted hardware)	1.0	125.0	125.0
Submersible Underwater Nitrate Sensor	1.0	20.0	20.0
Agilent Capillary Electrophoresis System	1.0	60.0	60.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$205.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Seabird Conductivity Temperature Depth (CTD) meter	1	PWSSC
WETlabs fluorometer	1	PWSSC
Satlantic SUNA	1	PWSSC
Mooring releases	2	PWSSC
Mooring flotation	4	PWSSC

FY12

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Robert Campbell	Principle Investigator	5.0	8.5		42.6
Robert Campbell - at sea rate	Principle Investigator	0.5	9.1		4.6
Technician TBD	Field/lab technician	12.0	6.2		74.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	23.8	0.0	
				Personnel Total	$121.6

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Alaska Marine Science Symposium	0.4	1	3	0.2	1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY13

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
PERSONNEL & TRAVEL
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Instrument calibration	3.0
Vessel charter	37.8
Network and Telephone	2.6
Printing	0.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$43.7

Commodities Costs: Description	Commodities Sum
Reagents and lab supplies	5.0
Mooring supplies	5.0
Sampling hardware	1.0
Commodities Total	$11.0

FY13

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Seabird Conductivity Temperature Depth (CTD) meter	1	PWSSC
WETlabs fluorometer	1	PWSSC
Satlantic SUNA	1	PWSSC
Mooring releases	2	PWSSC
Mooring flotation	4	PWSSC

FY13

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Robert Campbell	Principle Investigator	5.0	9.0		45.0
Robert Campbell - at sea rate	Principle Investigator	0.5	9.5		4.8
Technician TBD	Field/lab technician	12.0	6.3		75.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	24.8	0.0	
				Personnel Total	$125.4

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Alaska Marine Science Symposium	0.4	1	3	0.2	1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY14

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Instrument calibration	3.0
Vessel Charter	37.8
Network and telephone	2.6
Printing	0.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$43.7

Commodities Costs: Description	Commodities Sum
Reagents and lab supplies	5.0
Mooring supplies	5.0
Sampling Hardware	1.0
Commodities Total	$11.0

FY14

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Seabird Conductivity Temperature Depth (CTD) meter	1	PWSSC
WETlabs fluorometer	1	PWSSC
Satlantic SUNA	1	PWSSC
Mooring releases	2	PWSSC
Mooring flotation	4	PWSSC

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Robert Campbell	Principle Investigator	5.0	9.4		47.0
Robert Campbell - at sea rate	Principle Investigator	0.5	10.0		5.0
Technician TBD	Field/lab technician	12.0	6.6		79.2
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	26.0	0.0	
				Personnel Total	$131.2

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Alaska Marine Science Symposium	0.4	1	3	0.2	1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY15

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Instrument calibration	3.0
Vessel Charter	37.8
Network and telephone	2.6
Printing	0.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$43.7

Commodities Costs: Description	Commodities Sum
Reagents and lab supplies	5.0
Mooring supplies	5.0
Sampling Hardware	1.0
Commodities Total	$11.0

FY15

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Seabird Conductivity Temperature Depth (CTD) meter	1	PWSSC
WETlabs fluorometer	1	PWSSC
Satlantic SUNA	1	PWSSC
Mooring releases	2	PWSSC
Mooring flotation	4	PWSSC

FY15

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Robert Campbell	Principle Investigator	5.0	9.9		49.5
Robert Campbell - at sea rate	Principle Investigator	0.5	10.4		5.2
Technician TBD	Field/lab technician	12.0	6.8		81.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	27.1	0.0	
				Personnel Total	$136.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Alaska Marine Science Symposium	0.4	1	3	0.2	1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY16

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Instrument calibration	3.0
Vessel Charter	37.8
Network and telephone	2.6
Printing	0.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$43.7

Commodities Costs: Description	Commodities Sum
Reagents and lab supplies	5.0
Mooring supplies	5.0
Sampling Hardware	1.0
Commodities Total	$11.0

FY16

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Seabird Conductivity Temperature Depth (CTD) meter	1	PWSSC
WETlabs fluorometer	1	PWSSC
Satlantic SUNA	1	PWSSC
Mooring releases	2	PWSSC
Mooring flotation	4	PWSSC

FY16

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
EQUIPMENT DETAIL

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term Monitoring: Lingering Oil - Extending the Tracking of oil levels and weathering (PAH composition) in PWS through time.

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Mark Carls, principal investigator; Mandy Lindeberg and Jeep Rice, cooperating investigators

Study Location:

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al.

Estimated Budget:
EVOSTC Funding Requested:
(breakdown by fiscal year and must include 9% GA)

Non-EVOSTC Funds to be used:
(breakdown by fiscal year)

Date: May 18, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Identify the problem the project is designed to address. Describe the background and history of the problem. Include a scientific literature review that covers the most significant previous work history related to the project.

Justification

Intertidal areas in western Prince William Sound were extensively coated with Exxon Valdez oil; oil still remains in many beaches, presumably with declining impacts on intertidal invertebrates such as mussels, and also predators such as sea otters and harlequin ducks. This project would revisit approximately 12 of the worst case sites to continue the long term data set that tracks oil quantity and weathering composition in the contaminated sediments, and establish long term oil monitoring sites that would be re-sampled every 5 years over the next 20 years.

This project fills two needs: understanding the "dose" levels (past and present) for species such as mussels, intertidal invertebrates, sea otters, and harlequin ducks; and (2) understanding the natural degradation of quantity and composition of PAH over a long time course. Understanding exposure doses is important to injured species, and this would complement the biomarker analyses of lingering exposure on sea otters and harlequin ducks (Ballachey; Esler). Understanding oil loss over time is important for understanding full recovery of the habitat; in Alaska, this time course is apparently longer than in lower latitude environments. This study would complement and extend previous work, and would complement the remediation studies by Boufadel in 2011-12 as well as the Irvine study outside of PWS in 2011-12.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

List the objectives of the proposed research, the hypotheses being tested during the project, and briefly state why the intended research is important.

Project Concept

Continue monitoring a subset of beaches in Prince William Sound where sequestered oil is predicted to linger for long periods of time (decades). At least three predictive data sets will be considered in determining which beaches are monitored: (1) mussel bed time series started in the early 1990s[1], (2) beach surveys that were continued up to 2004[2], and spatial modeling analysis that was initiated in 2008[3]. Sampling techniques will allow extension of time series data (where they exist), detailed examination of hydrocarbons present (including PAHs, alkanes, and chemical biomarkers), verification of hydrocarbon source, weathering state, and estimation of the amount of remaining oil at specific sites. In addition to sediment samples, mussel tissue will also be examined for hydrocarbon loads to determine if PAHs are biologically available without sediment disturbance (such as that created by foraging activities). A limited number of passive samplers may be deployed in pits dug for sampling purposes to demonstrate the potential for biological exposure if (or when) sediment is disturbed.

Chemical analyses will be upgraded to include chemical biomarker data (terpanes, hopanes, and steranes); these compounds are the most recalcitrant compounds to biodegradation and weathering, and will yield a more complete picture of the biodegradation/weathering that has occurred over the last 25 plus years and the future 20 years. Biomarker data have not been collected in the past but are being incorporated in the remediation studies of 2011. We will analyze new samples, but also re-analyze samples collected in the past that are still stored and compliment the future sampling, plus Exxon Valdez source oil. In addition, biomarkers will be measured in a limited number of other known (stored) sources (Constantine Harbor, coal, and Monterey oil) for comparison and contrast with Exxon Valdez oil.

Lastly, to ensure integration between projects and with past monitoring, we will analyze a limited number of sediment samples collected from the intertidal monitoring project (e.g. from sea otter pits) and maintain the hydrocarbon database including new entries of all new sampling.

Future intentions: The periodic sampling (every 5 years) should be extended for three more cycles, ending on year 40 of the post spill era.

Objectives:

Objective 1. Determine quantity and weathering state at 12 beaches in PWS, in 2014, 25 years post spill.

a. Year 1 (2012). Retrospective analysis of biomarkers in Exxon Valdez oil, weathered Exxon Valdez oil, and other potential source oils in Prince William Sound (Constantine Harbor, coal, and Monterey oil). (year 2: Draft a biomarker report (and paper).

b. Year 2 (2013), determine specific subset of beaches to be sampled.

c. Year 3 (2014). Major field effort, 25 years after the spill.

i. Visit 10-12 beaches, collect sediment samples for PAH concentration and weathering profiles

ii. using random quadrats, measure the quantity of oil on specific beaches to estimate the quantity present.

iii. Collect mussels near oil patches to determine bioavailability in tissues.

iv. Place a limited number of passive samplers in disturbed areas to model oil bioavailability resultant from foraging activity. Pair these with samplers deployed without disturbance.

v. year 3,4. Begin and end the chemical analyses of samples collected in primary field effort, using state of the art GCMS, with chemical biomarkers included.

Objective 2- supplemental support analyses: Support on-going intertidal projects with chemical analyses, such as determine PAH levels in sea otter pits or prey items. This will integrate with the sea otter and harlequin duck biomarker measurements in those studies. 10-20 samples per year

Objective 3- Database: Maintain and add new data to the hydrocarbon database.

a. Add new information to hydrocarbon database. (This database contains data from all NRDA hydrocarbon samples from 1989 to present, including numerous data sets from investigators outside ABL.)

b. Prepare a complete FOIA package (100% of the chemical analyses have been FOIAed in the past, and these data will likely also be FOIAed.

Objective 4- Products: prepare annual and final reports as needed; supply collaborators with appropriate data (e.g. sea otter pit data to sea otter PI. Prepare synthesis manuscript summarizing environmental progress after 25 years.

B. Procedural and Scientific Methods

For each objective listed in A. above, identify the specific methods that will be used to meet the objective. In describing the methodologies for collection and analysis, identify measurements to be made and the anticipated precision and accuracy of each measurement and describe the sampling equipment in a manner that permits an assessment of the anticipated raw-data quality.

If applicable, discuss alternative methodologies considered, and explain why the proposed methods were chosen. In addition, projects that will involve the lethal collection of birds or mammals must comply with the Trustee Council's policy on collections, available at www.evostc.state.ak.us/Proposals/policies.htm.

Methods

1. Chemical analyses: Standard operating procedures developed at the Auke Bay Laboratories for hydrocarbon analysis will be used for all sample analyses. These have resulted in numerous peer-reviewed publications.
2. Beaches will be randomly drawn from the identified group of oiled beaches (n = 12).
3. Beach segments will be up to 100 m long. Sampling by quadrat will be random across beaches, divided by upper, middle, and lower tide intervals; all based on past studies.

4. Beaches will be accessed by charter boat during spring or summer months during one cruise. Passive samplers will be deployed at the front end of the cruise and picked up at the back end.

Project integration

1. This project continues hydrocarbon analyses started prior to 1989 in Prince William Sound and recorded in a hydrocarbon database that encompasses multiple agencies, collection sites, and matrices. This database has been maintained by Auke Bay Laboratory (ABL) personnel since the time of the Exxon Valdez oil spill.
2. The major field sampling of 2014 will use methods developed in earlier studies and will conform to those methods for intercomparison over time.
3. This project will complement "effects" studies by including some sampling/analyses specifically targeted to those projects, and will complement the remediation studies of Boufadel (same analyses with chemical biomarkers included), and will complement the tracking study by Irvine outside of PWS.

Project Logistics:

Major field effort in PWS in 2014 will be on a local charter, consisting of a field crew of up to 6 people. Federal personnel will lead the cruise effort, although some contract labor will likely be used for the labor intensive beach surveys. Laboratory logistics (chem labs, GCMS) will be at the Auke Bay Laboratories in Juneau Alaska. Senior staff will conduct the instrumental analyses, but processing effort will be by contractors.

C. Data Analysis and Statistical Methods

Describe the process for analyzing data. Discuss the means by which the measurements to be taken could be compared with historical observations or with regions that are thought to have similar ecosystems. Describe the statistical power of the proposed sampling program for detecting a significant change in numbers. To the extent that the variation to be expected in the response variable(s) is known or can be approximated, proposals should demonstrate that the sample sizes and sampling times (for dynamic processes) are of sufficient power or robustness to adequately test the hypotheses. For environmental measurements, what is the measurement error associated with the devices and approaches to be used?

D. Description of Study Area

Where will the project be undertaken? Describe the study area, including if applicable decimally-coded latitude and longitude readings of sampling locations or the bounding coordinates of the sampling region (e.g., 60.8233, -147.1029, 60.4739, -147.7309 for the north, east, south and west bounding coordinates). The formula for converting from degree minute seconds to decimal degrees is: degrees + (minutes/60) + (seconds/3600) so 121°8'6" = 121. + (8/60) + (6/3600) = 121.135

E. Coordination and Collaboration with Other Efforts

Indicate how your proposed project relates to, complements or includes collaborative efforts with other proposed or existing projects funded by the Trustee Council. Describe any coordination that has taken or will take place (with other Council funded projects, ongoing agency operations, activities funded by other marine research entities, etc.) and what form the coordination will take (shared field sites, research platforms, sample collection, data management, equipment purchases, etc.). If the proposed project requires or includes collaboration with other agencies, organizations or scientists to accomplish the work, such arrangements should be fully explained and the names of agency or organization representatives involved in the project should be provided. If your proposal is in conflict with another project, note this and explain why.

III. SCHEDULE

A. Project Milestones

For each project objective listed above (II.A.), specify when critical project tasks will be completed. Project reviewers will use this information in conjunction with annual project reports to assess whether projects are meeting their objectives and are suitable for continued funding. Please format your information like the following example.

Objective 1. Develop sediment-core chronologies in lake-productivity indicators.
To be met by September 2011

Objective 2. Compare sediment data corresponding to the past few decades to salmon population statistics.
To be met by December 2011

Objective 3. Reconstruct time-series of lake productivity, input of marine-derived nutrients, and salmon escapement.
To be met by April 2012

B. Measurable Project Tasks

Specify, by each quarter of each fiscal year, when critical project tasks (for example, sample collection, data analysis, manuscript submittal, etc.) will be completed. This information will be the basis for the quarterly project progress reports that are submitted to the Trustee Council Office. Please format your schedule like the following example.

FFY 11, 2nd quarter (January 1, 2011-March 31, 2011)
February: *Project funding approved by Trustee Council*

FFY 11, 3rd quarter (April 1, 2011-June 30, 2011)
April 30: *Core Upper Russian Lake*
May 30: *Core Delight Lake*

FFY 11, 4th quarter (July 1, 2011-September 30, 2011)
September 1: *Core Hidden Lake*

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)
December 15: *Begin analysis and report writing*

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)
January 18: *Annual Marine Science Symposium*

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)
April 15 *Submit final report. This will consist of a draft manuscript for publication to the Trustee Council Office.*

<u>Budget: total $ 199.2 K from 2012-2016</u>

Note: No federal salaries are included; soft funded labor is, 9% agency overhead is not included. Federal contribution in FTP salaries will exceed 300K.

2012	2013	2014	2015	2016
$18K	12K	$155.2K	$8K	$6K

2012. Main activity is retrospective sample analysis
25 EVO (previously analyzed) samples including source oil & sediment for weathering series for chemical biomarkers. $200/sample = $5K
15 Constantine, coal, and Monterey samples * $200/sample = 3K
Supplies, contract labor, 1 Anc trip. 10K
0-20 samples from other projects: no charge. $500 per sample above 20.
2013. Main activity is completion of sample design and draft biomarker report
Supplies, contract labor, 1 Anc trip 12K
0-20 samples from other projects: no charge.
2014. Main activity is field sampling, hydrocarbon measurement
Charter cost $3000 per day * 14 d = $42K
Supplies, shipping, FTP trav for field trip 8K
0-20 samples from other projects: no charge
Contract labor (5 diggers for field effort, 30K includes travel to CDV)
Chemical analyses : (assumes 12 beaches) total of 74K
9 sediment samples per beach (3 from each zone) = 108 samples * 500 $/sample = $54K
3 mussel samples per beach = 30 samples * 500 $/sample = $15K
4 PEMDs per beach at 3 beaches = 12 samples * 400 $/sample = $5K
Travel: 1 Anc trip 1.2K;
2015. Main activity: continue hydrocarbon measurement
Supplies, contract labor, 1 Anc trip $8K
0-20 samples from other projects: no charge
2016. Main activity: complete data analysis, FOIA package, and draft report
Supplies, contract labor, 1 Anc trip: 8K
0-20 samples from other projects: no charge

1. Carls, M.G., Harris, P.M. *Monitoring of oiled mussel beds in Prince William Sound and the Gulf of Alaska*; NOAA / NMFS, Auke Bay Laboratory: Juneau, AK, **2005**.
2. Short, J.W., Irvine, G.V., Mann, D.H., Maselko, J.M., Pella, J.J., Payne, J.R., Driskell, W.B., Rice, S.D., Slightly weathered *Exxon Valdez* oil persists in Gulf of Alaska beach sediments after 16 years. *Environmental Science & Technology* **2007,** 41, 1245-1250.
3. Michel, J. *Report on recent lingering oil studies*; EVOSTC project 070801?: date unknown, **2010?**

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$1.5	$1.5	$4.2	$1.5	$1.5	$10.2
Commodities	$14.0	$9.0	$130.0	$5.5	$4.0	$162.5
Equipment	$2.5	$1.5	$21.0	$1.0	$0.5	$26.5
Indirect Costs (*will vary by proposer*)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
SUBTOTAL	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
General Administration (9% of subtotal)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
PROJECT TOTAL	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: Portions of permanent staff salaries will be donated, including Dr. Jeep Rice, Mark Carls, Marie Larsen, Larry Holland, Josie Lunasin, and Mandy Lindeberg

FY12-16

Program Title:
Team Leader:

SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$1.5	$1.5	$4.2	$1.5	$1.5	$10.2
Contractual	$14.0	$9.0	$130.0	$5.5	$4.0	$162.5
Commodities	$2.5	$1.5	$21.0	$1.0	$0.5	$26.5
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$18.0	$12.0	$155.2	$8.0	$6.0	$199.2
General Administration (9% of subtotal)	$1.6	$1.1	$14.0	$0.7	$0.5	$17.9
PROJECT TOTAL	$19.6	$13.1	$169.2	$8.7	$6.5	$217.1
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: Portions of permanent staff salaries will be donated, including Dr. Jeep Rice, Mark Carls, Marie Larsen, Larry Holland, Josie Lunasin, and Mandy Lindeberg

FY12-16

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4A
TRUSTEE AGENCY
SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
one trip, Alaska Marine Science Symposium	0.5	1	5	0.2	1.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.5

FY12

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
technician, hydrocarbon processing	14.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$14.0

Commodities Costs: Description	Commodities Sum
solvents and supplies for hydrocarbon processing	2.5
Commodities Total	$2.5

FY12

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
muffle furnace		
HPLC		
GC/FID		
GC/MS		
ACE - accelerated solvent extractor		
steam tables		
glassware		
freezers		
balances		
computers		

FY12

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
one trip, Alaska Marine Science Symposium	0.5	1	5	0.2	1.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.5

FY13

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
technician, hydrocarbon processing	9.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$9.0

Commodities Costs: Description	Commodities Sum
solvents and supplies for hydrocarbon processing	1.5
Commodities Total	$1.5

FY13

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
muffle furnace		
HPLC		
GC/FID		
GC/MS		
ACE - accelerated solvent extractor		
steam tables		
glassware		
freezers		
balances		
computers		

FY13

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months Budgeted	Monthly Costs	Overtime	Personnel Sum
Name	Project Title				
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
Alaska Marine Science Symposium	0.5	1	5	0.2	1.5
Cordova	0.4	2	30	0.01	1.1
field workers air travel to Cordova	0.4	4	0	0.0	1.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$4.2

FY14

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
boat charter, $3000 per day * 14 days	42.0
technicians, hydrocarbon processing	68.0
field worker contracts (4)	20.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$130.0

Commodities Costs: Description	Commodities Sum
field supplies	9.0
solvents and supplies for hydrocarbon processing	12.0
Commodities Total	$21.0

FY14

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
muffle furnace		
HPLC		
GC/FID		
GC/MS		
ACE - accelerated solvent extractor		
steam tables		
glassware		
freezers		
balances		
computers		

FY14

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
one trip, Alaska Marine Science Symposium	0.5	1	5	0.2	1.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.5

FY15

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
technician, hydrocarbon processing	5.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$5.5

Commodities Costs: Description	Commodities Sum
solvents and supplies for hydrocarbon processing	1.0
Commodities Total	$1.0

FY15

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
muffle furnace		
HPLC		
GC/FID		
GC/MS		
ACE - accelerated solvent extractor		
steam tables		
glassware		
freezers		
balances		
computers		

FY15

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
one trip, Alaska Marine Science Symposium	0.5	1	5	0.2	1.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.5

FY16

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
technician, hydrocarbon processing	4.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$4.0

Commodities Costs: Description	Commodities Sum
solvents and supplies for hydrocarbon processing	0.5
Commodities Total	$0.5

FY16

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
muffle furnace		
HPLC		
GC/FID		
GC/MS		
ACE - accelerated solvent extractor		
steam tables		
glassware		
freezers		
balances		
computers		

FY16

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

12	13	14	15	16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

X

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**

DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

X

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

X

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

X

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**

DETAILED BUDGET FORM FY 12-FY16

X

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**

DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

X

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

X

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term monitoring: Pelagic monitoring component **-** Data synthesis, analysis and recommendations for sampling frequency and intensity of nearshore marine bird surveys to detect trends utilizing existing data from the Prince William Sound, Katmai and Kenai Fjords coastlines.

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Heather Coletti, Marine Ecologist, Southwest Alaska Network Inventory and Monitoring Program, National Park Service, Heather_Coletti@nps.gov, 907-644-3687
Collaborators: David Irons, James Bodkin, Brenda Ballachey, Tom Dean

Study Location: Prince William Sound, Katmai National Park and Preserve and Kenai Fjords National Park

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al. Skiff based surveys for marine birds along the Prince William Sound, Katmai and Kenai Fjords coastlines have been conducted for over 5 and 20 years, respectively. The results of these surveys provide estimates of the species composition, relative abundance, and distribution of all marine birds and mammals within this nearshore zone. The focus of these surveys is on marine birds that are trophically linked to the nearshore food web, and include species of sea ducks (Harlequin ducks, Barrow's and common goldeneye, and scoters), mergansers (common and red-breasted), and shorebirds, specifically the black oystercatcher, cormorants, glaucous-winged gulls and pigeon guillemots. Sustainability of long-term monitoring programs requires the optimization of sampling intensity and efforts to minimize costs while concurrently having sufficient power to detect a trend. While there has been critical thought in the past regarding these questions, current available analytical methods now allow for the use of existing data in simulations, using a Bayesian framework, to estimate number of samples and sample frequency required to detect a specified trend as well as examine effects contributing to variation, such as imperfect detection.

Estimated Budget: $52.7K
EVOSTC Funding Requested: $30K without GA; $32.7K with 9% GA
(breakdown by fiscal year and must include 9% GA)
FY12 - $32.7K
Non-EVOSTC Funds to be used:
(breakdown by fiscal year) FY12: $20K

Date: May 25, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

The National Park Service (NPS) Southwest Alaska Network (SWAN) Inventory and Monitoring Program (I&M) and the US Fish and Wildlife Service (USFWS) have been conducting skiff based surveys for marine birds along the Prince William Sound, Katmai and Kenai Fjords coastlines for over 5 and 20 years, respectively. These surveys do not currently account for imperfect detection nor do they focus on any single species in particular or nearshore habitat type. However, within the SWAN program, the goal is to estimate trends for a select group of marine bird species reliant on the nearshore food web and and that were impacted by the *Exxon Valdez* Oil Spill. These include: black oystercatchers (*Haematopus bachmani*), cormorants (*Phalacrocorax spp.*), glaucous-winged gulls (*Larus glaucescens*), goldeneyes (*Bucephala spp.*), harlequin ducks (*Histrionicus histrionicus*), mergansers (*Mergus spp.*), pigeon guillemots (*Cepphus columba*), and scoters (*Melanitta spp*.).

From preliminary analysis of NPS data, the current survey design does not provide variance estimates for detecting trends for the identified indicator species with suitable confidence (<0.50) depending on the species. We utilized coefficients of variance (CVs) to determine within year as well as across year variation for each species. NPS determined that we may not be adequately surveying for some species possibly because: (1) certain species are highly aggregated (2) we are focusing on inappropriate habitat for the species in question, (3) our sample size is too small or (4) the year to year variation in distribution is great enough that we should be conducting replicate surveys within a single season.

We are proposing to continue to monitoring existing transects to have continuity with legacy data, but to improve on existing protocols by minimizing variation by examining the effects of sampling error and imperfect detection while also making recommendations to improve efficiency through sample intensity and frequency. Improving sampling methods will provide a better sense of population trends of specific species (listed above) across the western Gulf of Alaska are and increase efficiency as we move forward in our efforts to monitor species of interest within the *Exxon Valdez* spill area.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled “Long-Term Monitoring of Marine Conditions and Injured Resources and Services,” and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

List the objectives of the proposed research, the hypotheses being tested during the project, and briefly state why the intended research is important.

Concept: We propose to use existing datasets from Prince William Sound, Katmai and Kenai Fjords to conduct data synthesis and analysis to answer questions regarding sampling intensity and sample frequency for detecting trends. These are essential components to building a long-term monitoring program. Even though critical thought has gone into this in the past, it seems prudent to utilize existing data to examine the following:

A. Use existing data in simulations, in a Bayesian framework, to estimate number of samples and sample frequency required to detect a specified trend or change with some level of confidence for selected species/species groups' density/abundance.
    i. The levels of change or trend deemed ecologically significant will be specified by the investigators.

B. Determine impact of imperfect detection
    i. Conduct a series of simulations applying different levels of detection bias, based on best available information, to evaluate the effects of various levels of detection bias (and variability therein) on some true population trend.
    ii. Assuming detection probabilities are not constant through time; determine the magnitude of the effects of variation in detection probability on trend estimates and the ability to detect trends if present.

This approach to the long-term monitoring effort may be a way of displaying for the Trustees that we are thinking about a long-term, sustainable monitoring program that will allow us to estimate trends that we deem ecologically important across a variety of temporal and spatial scales and providing information to inform the group of the scale and intensity of monitoring needed over potentially 20 yrs and cost saving due to reduced sampling where feasible based on simulation results.

There may be increased costs on the front-end for data synthesis and analysis, but if results allow for a decrease in sample intensity OR can identify areas that may require more efforts, the upfront costs may be minimal to the long-term costs of unnecessary sampling or poor power to detect trend.

Linkages: This exercise with utilize and link datasets spanning several years within Prince William Sound, Kenai Fjords and Katmai. Focal species include those that have exhibited protracted recovery from EVOS. This work would be an interagency effort between NPS, USFWS and USGS to improve the power to detect trends of coastal marine birds across the entire spill area.

B. Procedural and Scientific Methods
Logistics/Budget:

Data synthesis, analysis and reporting of results will be a one-time cost awarded to a contractor or university. Estimated cost for this work is approximately **30K**. The NPS/SWAN program will provide all existing data for the Kenai Fjords National Park and Katmai National

Park and Preserve coastlines. The USFWS will provide all pertinent survey data from PWS. The NPS/SWAN will also provide a marine ecologist to assist the contractor in the data synthesis, provide expertise as to ecosystem processes and provide assistance in the compilation and reporting of results. NPS/SWAN estimates that the in-kind support is equivalent to approximately **20k.** See table below.

C. Data Analysis and Statistical Methods

See above.

D. Description of Study Area

See above.

E. Coordination and Collaboration with Other Efforts

See above.

III. SCHEDULE

A. Project Milestones

For each project objective listed above (II.A.), specify when critical project tasks will be completed. Project reviewers will use this information in conjunction with annual project reports to assess whether projects are meeting their objectives and are suitable for continued funding. Please format your information like the following example.

Objective 1. Complete all necessary documents to the National Park Service contracting officials for review and submission.
To be met by November 2011

Objective 2. Compile marine bird survey data from Prince William Sound, Katmai National Park and Preserve and Kenai Fjords National Park.
To be met by January 2012

Objective 3. Provide final report with recommendations for continued monitoring.
To be met by December 2013

B. Measurable Project Tasks

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)

October:	*Project funding approved by Trustee Council*
November:	*Write contract for analysis and submit to NPS contracting officials*
November:	*Data compilation from PWS, KATM and KEFJ to begin*

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)

January:	*Continue data compilation*
March:	*Contract to be awarded*
March:	*Preliminary meetings with contractor to discuss data analysis options*

March: *Provide contractor with all available data in standardized format*

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)
April - June: *Begin analysis*

FFY 12, 4th quarter (July 1, 2012-September 30, 2012)
July - September: *Continue analysis and begin report writing in cooperation with the contractor.*

FFY 13, 1st quarter (October 1, 2012-December 31, 2012)
December: *Submit final report. This will consist of analysis results, statistical code developed for analysis and interpretation of results. Also provided will be recommendations for future monitoring.*

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$30.0	$0.0	$0.0	$0.0	$0.0	$30.0
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$30.0	$0.0	$0.0	$0.0	$0.0	$30.0
General Administration (9% of subtotal)	$2.7	$0.0	$0.0	$0.0	$0.0	$2.7
PROJECT TOTAL	$32.7	$0.0	$0.0	$0.0	$0.0	$32.7
Other Resources (Cost Share Funds)	$20.0	$0.0	$0.0	$0.0	$0.0	$20.0

COMMENTS: In-kind contributions will be for the staff time, primarily from NPS (approximately 2 months of a GS12), but also from USFWS and USGS, to gather and provide the data to the contractor as well as provide expertise as to ecosystem processes and provide assistance in the compilation and reporting of results.

FY12-16

Program Title:
Team Leader:
Agency:

FORM 4A
TRUSTEE AGENCY
SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY12

Program Title: Data synthesis, analysis and recommendations for sampling frequency and intensity of nearshore marine bird surveys to detect

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Data synthesis, analysis and recommendations for detecting trends in specific nearshore marine bird species	30.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$30.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY12

Program Title:
Team Leader:
Agency:

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title:
Team Leader:
Agency:

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY13

Program Title:
Team Leader:
Agency:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY13

Program Title:
Team Leader:
Agency:

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title:
Team Leader:
Agency:

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY14

Program Title:
Team Leader:
Agency:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY14

Program Title:
Team Leader:
Agency:

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title:
Team Leader:
Agency:

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY15

Program Title:
Team Leader:
Agency:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY15

Program Title:
Team Leader:
Agency:

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title:
Team Leader:
Agency:

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months Budgeted	Monthly Costs	Overtime	Personnel Sum
Name	Project Title				
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY16

Program Title:
Team Leader:
Agency:

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY16

Program Title:
Team Leader:
Agency:

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title:
Team Leader:
Agency:

FORM 4B
EQUIPMENT DETAIL

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long term monitoring: Environmental drivers component - Long-term monitoring of oceanographic conditions in Cook Inlet/Kachemak Bay to understand recovery and restoration of injured near-shore species.

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s):
Angela Doroff, Kachemak Bay Research Reserve, angela.doroff@alaska.gov and
Kris Holderied, NOAA Kasitsna Bay Laboratory, kris.holderied@noaa.gov

Study Location: Lower Cook Inlet and Kachemak Bay, Alaska

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al. The Kachemak Bay Research Reserve (KBRR) and NOAA Kasitsna Bay Laboratory jointly propose to continue and enhance oceanographic monitoring in Kachemak Bay and lower Cook Inlet, in order to provide the physical data needed for a comprehensive restoration monitoring program in the *Exxon Valdez* oil spill (EVOS) affected area. This project will leverage and enhance KBRR water quality monitoring stations, establish routine small boat oceanographic and plankton surveys to assess spatial, seasonal and inter-annual variability in water mass movement, leverage information from previous oceanographic surveys, provide environmental information to aid separately proposed benthic monitoring projects, and benefit from a new NOAA ocean circulation model for Cook Inlet. Long-term monitoring of physical changes and connectivity in the marine environment is essential to understand what drives both gradual and sudden changes in coastal ecosystems and estuarine systems in the affected area, including Prince William Sound and Cook Inlet. In addition to long-term effects from the EVOS, these coastal waters and habitats are impacted by the other physical stressors including climate change, ocean acidification, and continuing land-level and sedimentation changes from the 1964 earthquake and isostatic rebound from melting glaciers. The Cook Inlet/Kachemak Bay oceanographic information from this project will allow determination of patterns and trends in ocean circulation and plankton and aid in interpretation of biological monitoring data on the status and trends of injured resources in the near-shore environment. In conjunction with separately proposed oceanographic monitoring projects in PWS and the Gulf of Alaska, the project will enable assessment of whether circulation patterns in the Gulf of Alaska are synchronous with near-shore trends, which has implications for biological abundance and diversity. Our objective is to implement an enhanced, long-term Cook Inlet near-shore oceanographic monitoring program that directly informs management for sustained recovery and restoration of EVOS-injured resources in the face of environmental variability, shifts and long-term changes.

Estimated Budget:
EVOSTC Funding Requested (does not include 9% overhead G&A):
FY12: $171.0; FY13: $156.0; FY14: $153.7; FY15:$131.4; FY16: $101.8
TOTAL: $714.0
Non-EVOSTC Funds to be used:
FY12: $155.0; FY13: $155.0; FY14: $155.0; FY15: $155.0; FY16: $155.0
TOTAL: $775.0

Date: June 1, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT
A. Statement of Problem

Justification
The proposed lower Cook Inlet/Kachemak Bay monitoring project is designed to assist in the evaluation of recovery and restoration of injured resources in the foot print of the *Exxon Valdez* oil spill (EVOS) by providing oceanographic (temperature, salinity, turbidity), water quality, and plankton monitoring information to: 1) help understand trends observed in near-shore biological monitoring proposed under the Benthic Monitoring component of our integrated proposal (see Konar and Iken project); 2) determine if oceanic conditions and changes in the Gulf of Alaska are synchronous with near-shore trends. (see also the Weingartner and Hopcroft projects); and 3) help determine how these patterns and linkages compare between Cook Inlet and Prince William Sound (PWS) (see also the Campbell project). Long-term monitoring of physical changes is essential to understand what drives both gradual and sudden changes in coastal ecosystems. Kachemak Bay, like PWS, has been impacted by the EVOS and coastal habitats in both regions face other physical stressors including climate change, ocean acidification, and continuing land-level changes from the 1964 earthquake and isostatic rebound from melting glaciers.

This project will leverage and expand several long-term (10 years and longer) physical and biological monitoring data series in Kachemak Bay and benefit from current development of an operational NOAA ocean circulation model for Cook Inlet. It will expand on previous Cook Inlet studies on oceanography by Okkonen et al (2009) and Okkonen and Howell (2003) and on physical and biological linkages by Speckman et al. (2005). The project will also leverage Gulf of Alaska data collected during the current NPRB Gulf of Alaska Integrated Ecosystem Research Program (GOAIERP). The physical monitoring program will complement separately proposed Kachemak Bay benthic species monitoring (invertebrates, macroalgae, and sea otters – see Konar and Iken project) as well as annual Alaska Department of Fish and Game shellfish surveys. The National Park Service and U.S. Geological Survey have also implemented near-shore monitoring of injured resources along the Katmai, Kenai Fjords, and Lake Clark National Park coasts since 2006. To date, that monitoring has not been correlated with annual and seasonal circulation patterns in lower Cook Inlet and our project will allow such correlations, as well as a comparison to similar physical-biological linkages in PWS from other projects in the integrated proposal (see Campbell and Ballachey et al.). Because of the rich data history in Kachemak Bay and lower Cook Inlet, pairing the physical and biological near-shore monitoring will facilitate understanding of the impacts of environmental drivers throughout the spill-affected area. The project goal is to monitor oceanographic conditions in lower Cook Inlet and Kachemak Bay, at scales that will improve understanding of environmental conditions which may inhibit full recovery of injured resources or adversely impact recovered resources.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," and submited by McCammon et. al.

II. PROJECT DESIGN
A. Objectives

Project objectives

We propose to enhance existing oceanographic monitoring programs in Kachemak Bay and lower Cook Inlet to correlate annual and seasonal patterns and trends in ocean conditions with near-shore monitoring of injured resources and ocean conditions in the Gulf of Alaska and PWS. Specific objectives include:

1. Examine the short-term variability and track long-term trends in oceanographic and water quality parameters and plankton communities.

2. Provide environmental forcing data for correlation with biological data sets.

3. Improve understanding of water mass movement in Kachemak Bay and lower Cook Inlet.

4. Determine linkages, and temporal variability in those links, between Kachemak Bay/lower Cook Inlet, the Alaska Coastal Current and PWS, using oceanographic data from PWS, GAK1 mooring, Seward Line and NPRB GOAIERP shipboard sampling along the shelf adjacent to Cook Inlet.

Project integration

The Kachemak Bay Research Reserve (KBRR), a State of Alaska and NOAA partnership, and the NOAA Kasitsna Bay Laboratory (KBL) are collaborating on this oceanographic monitoring project to cost-effectively leverage organization resources as well as historical data sets. To aid in interpreting the relative effects of oceanic and estuarine changes on the status and trends of injured resources in the near-shore environment, data from this effort will be related to oceanographic and plankton monitoring in Prince William Sound (Campbell proposal in the integrated program), the outer Kenai Peninsula coast (Weingartner and Hopcroft proposals), along the Gulf of Alaska (Batten proposal), and from two field years of the NPRB-funded GOAIERP. The KBRR has 10 years of water quality and meteorological data at two System-Wide Monitoring Program (SWMP) sites in Homer and Seldovia harbors. CTD temperature and salinity profile data has been collected with varying frequencies along several transects in Kachemak Bay and lower Cook Inlet, including during recent studies by Okkonen et al., 2009 and Murphy, 2010. KBRR also has near-surface salinity and temperature data on ferry routes from lower Cook Inlet to Kodiak. Water level and temperature data from 1964 to present are available from the NOAA tide station at Seldovia. Complementing the physical data, annual intertidal invertebrate and macroalgae monitoring has been conducted at sites near KBL for 9 and 10 years (also see Konar and Iken proposal). Other data sets, including extensive U.S. Fish and Wildlife Service sea otter and ADF&G shellfish surveys, also overlap the time periods of the physical data records in this region.

Leveraging

As described in Section A above, this project will leverage and expand several long-term physical oceanographic time series in Kachemak Bay, provide environmental data to support understanding in biological monitoring proposed under the integrated program as well as biological monitoring outside the EVOSTC-funded program, and benefit from current development of an operational NOAA ocean circulation model for Cook Inlet. KBRR will provide resources for continuous monitoring of water quality and meteorological data as part of the SWMP and our project will add an additional seasonal station to that existing program. KBL will provide equipment and staff time to conduct CTD data collection. A Cook Inlet circulation model is being developed by the NOAA Coast Survey Development Laboratory and scheduled to be operational in 2013. The model will significantly help to integrate the oceanographic data in both space and time. The data collected through this project and from historical time series will facilitate the data synthesis effort of the integrated program and specifically support the year 3 joint workshop between the EVOSTC-funded long-term monitoring and herring programs. The combination of oceanographic data collected as part of the integrated program (this project, Campbell, Weingartner, Hopcroft, and through the NPRB GOAIERP will improve understanding of linkages between marine conditions on the Gulf of Alaska shelf and in the near-shore waters of Kachemak Bay, lower Cook Inlet and PWS. Determining local trends and linkages across the larger region will facilitate understanding of the environmental impacts on observed trends in the status of injured resources. Collectively, KBRR and KBL will make $155K per year of in-kind contributions to this project.

References

Murphy, M. (2010) Larval Transport of Brachyuran crab in Kachemak Bay, Alaska, MS Thesis, University of Alaska Fairbanks, Fairbanks, AK, pp. 1-113.

Okkonen S. R. (2005) Observations of hydrography and currents in central Cook Inlet, Alaska during diurnal and semidiurnal tidal cycles. Final Report OCS Study MMS 2004-058, University of Alaska Coastal Marine Institute, University of Alaska Fairbanks and USDOI, MMS, Alaska OCS Region, pp 1-24.

Okkonen S. R., Pegau S., Saupe S. (2009) Seasonality of boundary conditions for Cook Inlet, Alaska. Final Report OCS Study MMS 2009-041, University of Alaska Coastal Marine Institute, University of Alaska Fairbanks and USDOI, MMS, Alaska OCS Region, pp 1-59.

Speckman S. G., Piatt J. F., Minte-Vera C. V., Parrish J. K. (2005) Parallel structure among environmental gradients and three trophic levels in a subarctic estuary. Progress in Oceanography 66:25-65.

B. Procedural and Scientific Methods

Project approach and logistics

The proposed Kachemak Bay and lower Cook Inlet environmental monitoring project will include data collection at continuous SWMP water quality stations in Kachemak Bay, monthly shipboard oceanographic measurements in Kachemak Bay, and seasonal shipboard oceanographic measurements in lower Cook Inlet.

In Kachemak Bay, the proposed oceanographic monitoring will combine: 1) continuous data from existing KBRR water quality and meteorological monitoring stations at the Homer and Seldovia harbors; 2) an additional shoreline water quality station to be deployed during ice-free months in Bear Cove (near head of Kachemak Bay); and 3) monthly small-boat surveys of temperature and salinity profiles, using conductivity-temperature-depth (CTD) profiler instruments on a transect across Kachemak Bay at the Homer Spit (see Figures 1 and 2). KBRR and KBL small boats will be used for Kachemak Bay sampling. The water quality stations each have two YSI sondes to measure near-surface and near-bottom temperature, salinity, dissolved oxygen, turbidity, and pH. A Sea-Bird Electronics (SBE)19plus SEACAT CTD profiler will be used to acquire surface to bottom profiles of temperature and salinity at ten stations along the transect, with approximately 400 meters between stations. Turbidity measurements will be made with an integrated WETLabs ECO Fluorometer sensor integrated with the CTD profiler. At each station, the CTD profiler will be lowered at 1 meter/second from approximately 2 meters depth to 1-2 meters from the bottom, with a sample rate of 4 times/second. Station location will be recorded from vessel-mounted or handheld GPS units. Oceanographic data collected along shipboard transects in year 1 and 2 of the project will be analyzed for spatial and temporal (seasonal and annual) patterns, to determine if deployment of moored instruments could be used as an alternative in the final three years of the project and beyond.

In lower Cook Inlet, oceanographic monitoring will include quarterly shipboard CTD and plankton sampling, conducted at stations along transect lines across the entrance of Cook Inlet and northwest from Anchor Point (see Figure 1). A third line from Augustine Volcano to Flat Island may be sampled as an alternative to sampling the entrance line twice on a given survey (dotted line on Figure 1). The same instruments described above will be used on these surveys. Chartered boats will be used for Cook Inlet sampling, due to the routine presence of higher sea state conditions in the inlet. Station spacing will be between 1.5 and 4 km, with closer station spacing near the coasts. The sampling design leverages existing CTD survey data collected along the proposed lines, as well as along four other Cook Inlet transects (Okkonen et al., 2009). The Barabara Point line in outer Kachemak Bay will also be sampled during the Cook Inlet oceanographic surveys, to have use of the larger chartered boat for these more exposed waters. Within the project budget limit, it will only be possible to conduct the proposed lower Cook Inlet sampling during the first three years of the project. During years 4 and 5, we therefore propose to reduce the charter boat time and allocate more staff time from field data collection to data synthesis, relative to the first 3 years of the project.

Water samples will be collected at a subset of stations along each CTD transect for nutrient and chlorophyll-a analyses, and vertical plankton net tows will be conducted for zooplankton sampling. Water samples will be shipped to Rob Campbell at the Prince William Sound Science Center (PWSSC) for plankton and nutrient analyses under a separate project in our integrated proposal. The collaboration with PWSSC on sample analyses will allow us to make a cost-effective assessment of lower trophic levels and compare to patterns observed in PWS (Campbell proposal) and the outer Kenai coast (Hopcroft proposal). The timing of the water sampling will also attempt to capture productive conditions before, during and after the spring and autumn phytoplankton blooms. Stage composition of the copepod species sampled by the plankton net will also give information on changes in seasonal timing (phenology).

Meteorological data will also be obtained from NOAA and KBRR weather stations in Kachemak Bay and Cook Inlet for assessment of atmospheric forcing conditions.

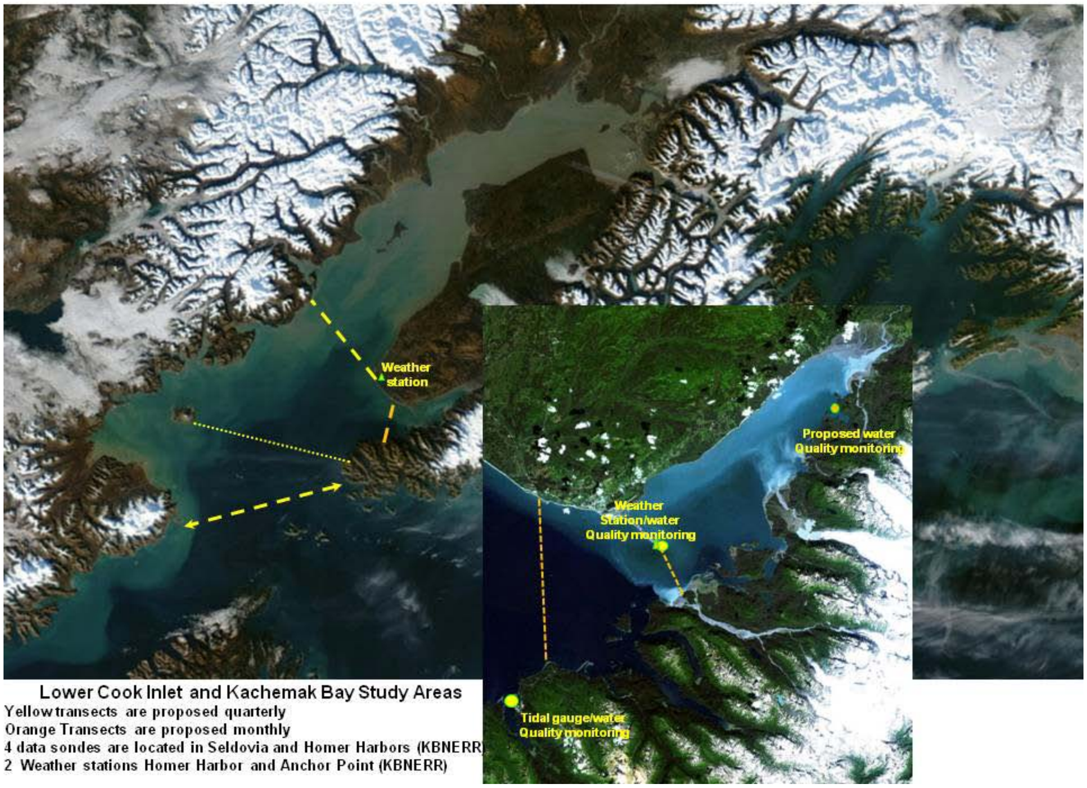


Figure 1. Proposed oceanographic monitoring locations in Kachemak Bay and lower Cook Inlet

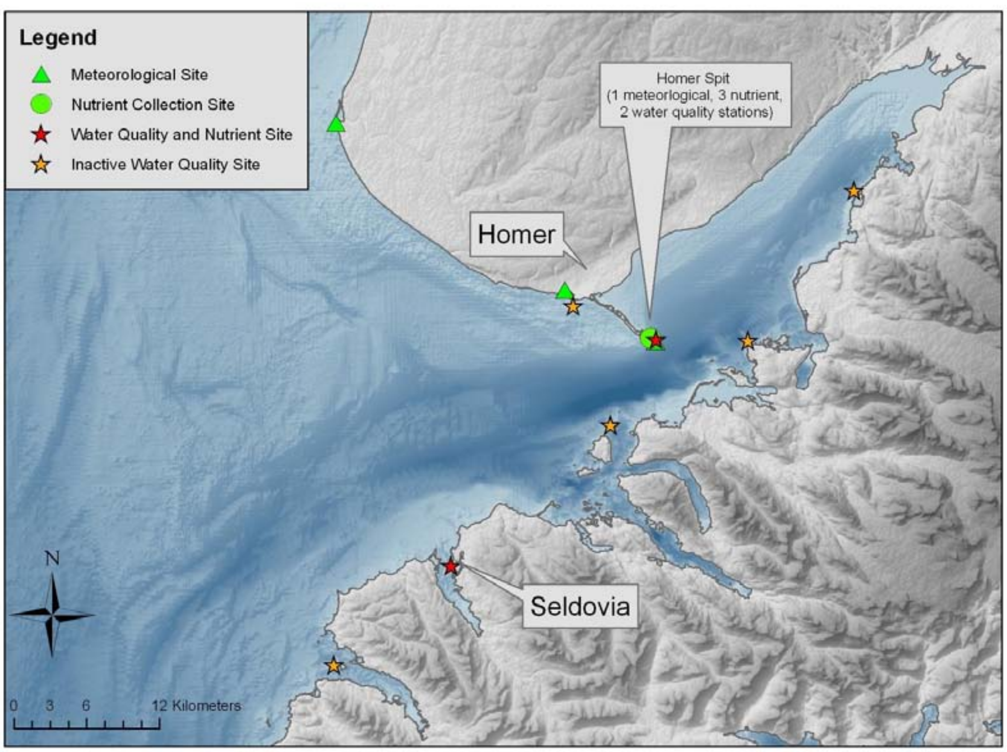


Figure 2. Locations of meteorological (green triangles) water quality (red stars) nutrient (green circles) and historic water quality stations (orange stars) within Kachemak Bay, Alaska.

C. Data Analysis and Statistical Methods

All KBRR long-term water quality and meteorological data incur primary data quality assurance-quality control (QAQC) at the National Estuarine Research Reserve System Central Data Management Office (CDMO). Within one week of data retrieval as the provisional data are ingested into the CDMO database. The data are then emailed back to KBRR, where Reserve staff use tools provided by the CDMO, Microsoft Excel macros, to perform secondary QAQC on the data. Data that have been through secondary QAQC are submitted back to the CDMO quarterly and again annually and these data are posted as provisional plus. After annual submission to the CDMO is complete, the data undergo final tertiary QAQC by the CDMO. The data and accompanying metadata documentation are checked for completeness before dissemination as authenticated historical data via the CDMO Online Data Information Server (http://cdmo.baruch.sc.edu). Table 1 provides sensor specifications for the water quality sondes, Table 2 provides specifications for the nutrient sensors, and Table 3 provides specifications for the meteorological station sensors.

SEACAT CTD profiler data from all transects will be initially processed with standard SBE Seasoft software algorithms and averaged into 1 meter depth bins. Subsequent data processing will use Matlab software algorithms to compute density and construct along-transect distance versus depth contour plots of temperature, salinity and density. Density fields will be used to estimate the degree of vertical stratification at each station. Lateral variability across the transect and temporal variability between sampling periods will be assessed by calculating means and standard deviations for temperature, salinity and density fields. A least-squared analysis will be used to assess seasonal and annual patterns along the Homer Spit transect. The amount of freshwater at each station within the upper part of the water column will also be calculated using a reference salinity (~32 psu) consistent with earlier studies.

As described above water quality station data is provided on-line in near-real-time by the CDMO and we will work with the data management team to incorporate the data and metadata in the integrated program data services. We will also provide CTD and data in a format and with metadata compatible with the data management protocols of the integrated monitoring program. CTD data will be provided to other integrated program investigators and publicly through the program website as soon as practical, and no later than a year after initial data collection. Plankton and nutrient data analyses will be provided to the data management team by Rob Campbell, through the collaboration with PWSSC described above. We will also assist the integrated program data management team to synthesize past oceanographic data from the existing water quality station time series and CTD surveys in lower Cook Inlet.

Table 1: Specifications for water quality station sensors

Parameter	Units	Sensor Type	Model	Range	Accuracy	Resolution
Temperature	Celsius (C)	Thermistor	6560	-5 to 50 °C	+/-0.15 °C	0.01 °C
Conductivity	milli-Siemens per cm (mS/cm)	4-electrode cell with autoranging	6560	0 to 100 mS/cm	+/-0.5% of reading + 0.001 mS/cm	0.001 mS/cm to 0.1 mS/cm (range dependent)
Salinity	parts per thousand (ppt)	Calculated from conductivity and temperature		0 to 70 ppt	+/- 1.0% of reading or 0.1 ppt, whichever is greater	0.01 ppt
Dissolved Oxygen %	percent air saturation (%)	Rapid Pulse – Clark type, polarographic	6562	0 to 500 % air saturation	0-200 % air saturation, +/- 2 % of the reading or 2 % air saturation, whichever is greater; 200-500 % air saturation, +/- 6 % of the reading	0.1 % air saturation
Dissolved Oxygen mg/L	milligrams per Liter (mg/L); Calculated from % air saturation, temp and salinity	Rapid Pulse – Clark type, polarographic	6562	0 to 50 mg/L	0 to 20 mg/L, +/- 2 % of the reading or 0.2 mg/L, whichever is greater; 20 to 50 mg/L, +/- 6 % of the reading	0.01 mg/L
Dissolved Oxygen %	% Saturation	Optical probe w/ mechanical cleaning	6150 ROX	0 to 500% air saturation	0-200% air saturation: +/- 1% of the reading or 1% air saturation, whichever is greater; 200-500% air saturation: +/- 15% or reading	0.1% air saturation
Dissolved Oxygen mg/L	milligrams/Liter (mg/L)	Optical probe w/ mechanical cleaning	6150 ROX	0 to 50 mg/L	0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater; 20 to 50 mg/L: +/- 15% of the reading	0.01 mg/L
Depth	feet or meters (m)	Stainless steel strain gauge		0 to 30 ft (9.1 m)	+/- 0.06 ft (0.018 m)	0.001 ft (0.001 m)
pH	units	Glass combination electrode	6561 and 6561FG	0 to 14 units	+/- 0.2 units	0.01 units
Turbidity	nephelometric turbidity units (NTU)	Optical, 90 ° scatter, with mechanical cleaning	6136	0 to 1000 NTU	+/- 2 % reading or 0.3 NTU (whichever is greater)	0.1 NTU

Table 2. Specifications for nutrient sensors at water quality stations

Category	Parameter	Variable Name	Units of Measure	Measurement type	MDL (µg/L)	Laboratory
Phosphorus	Orthophosphate, Filtered	PO4F	mg/L as P	Measured	1.5	VIMS, UW, Cook Inlet Keeper
Nitrogen	Nitrite + Nitrate, Filtered	NO23F	mg/L as N	Measured	1	VIMS, UW, Cook Inlet Keeper
	Nitrite, Filtered	NO2F	mg/L as N	Measured	0.2	VIMS, UW, Cook Inlet Keeper
	Nitrate, Filtered	NO3F	mg/L as N	Calculated NO23F - NO2F	-	VIMS, UW, Cook Inlet Keeper
	Ammonium, Filtered	NH4F	mg/L as N	Measured	5.4	VIMS, UW, Cook Inlet Keeper
	Dissolved Inorganic Nitrogen	DIN	mg/L as N	Calculated NO23F + NH4F	-	VIMS, UW, Cook Inlet Keeper
Plant Pigments	Chlorophyll a	CHLA_N	µg/L	Measured	0.02	KBRR
	Phaeophytin	PHEA	µg/L	Measured	0.02	KBRR
Other Lab Parameters	Silicate, Filtered	SiO4F	mg/L as SI	Measured	8	VIMS, UW, Cook Inlet Keeper

Table 3. Specifications for meteorological stations

Parameter	Units	Sensor Type	Model	Range	Accuracy	Other
Temperature	Celsius (°C)	Platinum resistance temperature detector (PRT)	HMP45ASP Temperature and Relative Humidity Probe	-40°C to +60°C	± 0.2 °C @ 20°C	
Relative Humidity	Percent (%)	Vaisala HUMICAP© 180 capacitive relative humidity sensor	HMP45ASP Temperature and Relative Humidity Probe	0-100% non-condensing	Accuracy at 20°C: +/- 2% RH (0-90%) and +/- 3% (90-100%)	Temperature dependence of RH measurement: +/- 0.05% RH/°C
Barometric Sensor	millibars (mb)	Vaisala Barocap © silicon capacitive pressure sensor	CS-105	Pressure: 600 to 1060 mb; Temperature: -40°C to +60°C; Humidity: non-condensing	± 0.5 mb @ 20°C; +/- 2 mb @ 0°C to 40°C; +/- 4 mb @ -20°C to 45°C; +/- 6 mb @ -40°C to 60°C	Stability: ± 0.1 mb per year
Wind direction	degrees	balanced vane, 38 cm turning radius	R.M. Young 05103 Wind Monitor	360° mechanical, 355° electrical (5° open)	+/- 5%	
Wind Speed	meter per second (m/s)	18 cm diameter 4-blade helicoids propeller molded of polypropylene	R.M. Young 05103 Wind Monitor	0-60 m/s (130 mph); gust survival 100 m/s (220 mph)	+/- 2%	
Precipitation	Milli-meters (mm)	Heated Tipping Bucket Rain Gauge	MetOne 380	Temperature: 0° to +/- 50°C; Humidity: 0 to 100%	+/- 1.0% up to 1 in./hr; +0, -3% from 1 to 2 in./hr; +0, -5% from 2 to 3 in./hr	Rainfall per tip: 0.01 inch
Precipitation	Milli-meters (mm)	Heated Tipping Bucket Rain Gauge	Texas Electronics 525	Temperature: 0° to +/- 50°C; Humidity: 0 to 100%	+/- 1.0% up to 1 in./hr; +0, -3% from 1 to 2 in./hr; +0, -5% from 2 to 3 in./hr	Rainfall per tip: 0.01 inch
LI-COR Quantum Sensor	mmoles m-2 (total flux)	High stability silicon photovoltaic detector (blue enhanced)	LI190SB	Light spectrum waveband: 400 to 700 nm; Operating Temperature: -40°C to 65°C; Humidity: 0 to 100%	typically 5 µA per 1000 µmoles s-1 m-2	Stability: <±2% change over 1 yr
Li-Cor Pyranometer	mA per 1000 W m-2	High stability silicon photovoltaic detector (blue enhanced)	LI200SZ	Light spectrum waveband: 400 to 1100 nm; Operating Temperature: -40°C to 65°C; Humidity: 0 to 100%	0.2 kW m-2 mV-1	Stability: <±2% change over 1 yr

D. Description of Study Area

Our study area is includes all of lower Cook Inlet and Kachemak Bay, Alaska (60.056, -154.365; 60.02, -150.9; 58.573, -154.349; 58.539, -151.033). See Figures 1 and 2 above. In order to improve our understanding of the physical environment (hydrographic properties at the inflow and outflow boundaries in lower Cook Inlet and water exchange with Kachemak Bay) we are proposing to replicate CTD transects conducted by Okkenon et al. (2009) and Murphy (2010) and document interactions between the physical and biological properties of the study area through nutrient sampling and plankton collection and identification. During 2012 to 2014 we will collect hydrographic measurements along transect lines crossing: 1) Kennedy Entrance and Stevenson Entrance from Port Chatham to cape Douglas; 3) Cook Inlet from Red River to Anchor Point; 4) Kachemak Bay from Barbara Point to Bluff Point, with an alternate transect line in lower Cook Inlet being Magnet Rock to Augustine Volcano. In Kachemak Bay, a single transect will be sampled monthly from the Homer Spit to Mckeon Spit during the entire study period and a YSI data sonde compatible with ongoing water quality measurements will be deployed at the head of Kachemak Bay during summer months in Bear Cove.

E. Coordination and Collaboration with Other Efforts

See discussion above and in the narrative for the integrated proposal for details of coordination and collaboration with other efforts.

III. SCHEDULE

A. Project Milestones. Note that focus on timeline to meet objectives is for the first three years.

Objective 1. Examine the short-term variability and track long-term trends in oceanographic and water quality parameters and plankton communities

a. Develop data structure for historical and new data for this project
To be met by May 2012

b. Integrate water quality station data into integrated program data management system
To be met by October 2012 (near real-time data already provided via CDMO)

c. Provide oceanographic data from CTD surveys to integrated program data management team
To be met within one year of CTD data collection (ongoing through project)

Objective 2. Provide environmental forcing data for correlation with biological data sets

a. Complete initial synthesis of KBRR and KBL historical oceanographic data
To be met by October 2012

b. Provide oceanographic data from CTD surveys to integrated program investigators
To be met within one year of CTD data collection (ongoing through project)

c. Complete synthesis of lower Cook oceanographic data to support year 3 workshop between long-term monitoring and herring programs
To be met by October 2013

Objective 3. Improve understanding of water mass movement in Kachemak Bay and lower Cook Inlet
a. Develop initial oceanographic trend visualization tool in conjunction with the science synthesis team of the integrated program
To be met by October 2012
b. Submit manuscript for publication in peer-reviewed scientific journal
To be met by October 2014

Objective 4. Determine linkages, and temporal variability in those links, between Kachemak Bay/lower Cook Inlet, the Alaska Coastal Current and PWS
a. With other integrated program investigators, science synthesis team and data management team, produce initial synthesis of oceanographic data across the region to support the year 3 workshop between the long-term monitoring and herring programs.
To be met by October 2013
b. Submit manuscript for publication in peer-reviewed scientific journal
To be met by October 2016

B. Measurable Project Tasks

YEAR 1
FFY 12, 1st quarter (October 1, 2011-December 31, 2011)

September:	*Project funding approved by Trustee Council*
November:	*Principal Investigator meeting for long-term monitoring program*
December:	*Start collection of historical data*

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)

January:	*Annual Alaska Marine Science Symposium*
February:	*Start monthly CTD surveys*
March:	*Start quarterly lower Cook Inlet and Barbara Point line surveys*

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)

May:	*Purchase additional YSI sonde for Bear Cove site*
	Complete initial gathering of existing oceanographic data
	Set up data structure for historical and new data from this project
June:	*Conduct lower Cook Inlet CTD survey*

FFY 12, 4th quarter (July 1, 2012-September 30, 2012)

July:	*Install seasonal water quality sonde in BearCove*
	Continue monthly CTD surveys in Kachemak Bay
	Provide input to integrated program team for annual report to TC
September:	*Conduct lower Cook Inlet CTD surveys*

YEAR 2:

FFY 13, 1st quarter (October 1, 2012-December 31, 2012)

October:	*Continue monthly CTD transects in Kachemak Bay*
	Complete initial collection of historical and new project data
	Provide initial oceanographic trend visualization tool for water quality station data
November:	*Principal Investigator meeting for long-term monitoring program*
December:	*Remove Bear Cove water quality sonde for winter*
	Conduct lower Cook Inlet CTD survey

FFY 13, 2nd quarter (January 1, 2013-March 31, 2013)

January:	*Annual Alaska Marine Science Symposium*
	Continue monthly CTD surveys in Kachemak Bay
March:	*Conduct lower Cook Inlet CTD survey*

FFY 13, 3rd quarter (April 1, 2013-June 30, 2013)

April:	*Install BearCove water quality monitoring station*
	Continue monthly CTD surveys in Kachemak Bay
June:	*Conduct lower Cook Inlet CTD survey*

FFY 13, 4th quarter (July 1, 2013-September 30, 2013)

July:	*Continue monthly CTD surveys in Kachemak Bay*
	Provide input to integrated program team for annual report to TC
September:	*Conduct lower Cook Inlet CTD survey*

YEAR 3:

FFY 14, 1st quarter (October 1, 2013-December 31, 2013)

October:	*Continue monthly CTD transects in Kachemak Bay*
	Provide historical/new data synthesis for workshop
November:	*Principal Investigator meeting for long-term monitoring program and joint workshop with herring program*
December:	*Remove Bear Cove water quality sonde for winter*
	Conduct lower Cook Inlet CTD survey

FFY 14, 2nd quarter (January 1, 2014-March 31, 2014)

January:	*Annual Alaska Marine Science Symposium*
	Continue monthly CTD surveys in Kachemak Bay
March:	*Conduct lower Cook Inlet CTD survey*

FFY 14, 3rd quarter (April 1, 2014-June 30, 2014)

April:	*Install BearCove water quality monitoring station*
	Continue monthly CTD surveys in Kachemak Bay
June:	*Conduct lower Cook Inlet CTD survey*

FFY 14, 4th quarter (July 1, 2014-September 30, 2014)

July:	*Continue monthly CTD survey in Kachemak Bay*
	Provide input to integrated program team for annual report to TC
September:	*Conduct lower Cook Inlet CTD survey*
	Submit draft manuscript to peer-reviewed scientific journal

YEAR 4:

FFY 15, 1st quarter (October 1, 2014-December 31, 2014)

October:	*Continue monthly CTD survey in Kachemak Bay*
November:	*Principal Investigator meeting for long-term monitoring program*
December:	*Remove Bear Cove water quality sonde for winter*
	Start reduced Cook Inlet CTD survey. Timing in years 4 and 5 will depend on available funding and needs identified from data synthesis.

FFY 15, 2nd quarter (January 1, 2015-March 31, 2015)

January:	*Annual Alaska Marine Science Symposium*
	Continue monthly CTD surveys in Kachemak Bay

FFY 15, 3rd quarter (April 1, 2015-June 30, 2015

April:	*Install BearCove water quality monitoring station*
	Continue monthly CTD survey in Kachemak Bay

FFY 15, 4th quarter (July 1, 2015-September 30, 2015)

July:	*Continue monthly CTD survey in Kachemak Bay*
	Provide input to integrated program team for annual report to TC

YEAR 5:

FFY 16, 1st quarter (October 1, 2015-December 31, 2015)

October:	*Continue monthly CTD survey in Kachemak Bay*
November:	*Principal Investigator meeting for long-term monitoring program*
December:	*Remove Bear Cove water quality sonde for winter*

FFY 16, 2nd quarter (January 1, 2016-March 31, 2016)

January:	*Annual Alaska Marine Science Symposium*
	Continue monthly CTD survey in Kachemak Bay

FFY 16, 3rd quarter (April 1, 2016-June 30, 2016

April:	*Install BearCove water quality monitoring station*
	Continue monthly CTD surveys in Kachemak Bay

FFY 16, 4th quarter (July 1, 2016-September 30, 2016)

July:	*Continue monthly CTD survey in Kachemak Bay*
	Provide input to integrated program team for final report to TC
September:	*Submit draft manuscript to peer-reviewed scientific journal*

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$66.0	$69.3	$72.8	$64.2	$63.2	$335.5
Travel	$7.8	$7.8	$7.8	$12.7	$7.8	$44.1
Contractual	$52.3	$54.3	$54.3	$28.3	$14.3	$203.5
Commodities	$21.1	$23.6	$17.8	$17.4	$14.5	$94.4
Equipment	$28.8	$7.7	$0.0	$0.0	$0.0	$36.5
SUBTOTAL	$176.0	$162.7	$152.7	$122.7	$99.8	$714.0
General Administration (9% of subtotal)	$15.8	$14.6	$13.7	$11.0	$9.0	$64.3
PROJECT TOTAL	$191.9	$177.4	$166.5	$133.7	$108.8	$778.2
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

In-Kind contributions: FY12 - FY16: $600.0 K in NOAA System-Wide Monitoring Program ($120.0K/year)
FY12 - FY16: $50.0K in CTD equipment ($10.0K/year)
FY12 - FY16: $125.0K in salary support for Kris Holderied and KBL staff ($25.0K/year)

FY12-16

Program Title: LTM-Lower Cook Inlet
Team Leader: Doroff and Holderied

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$66.0	$69.3	$72.8	$64.2	$63.2	$335.5
Travel	$3.7	$3.7	$3.7	$6.1	$3.7	$20.9
Contractual	$49.8	$51.8	$51.8	$25.8	$11.8	$191.0
Commodities	$8.1	$16.6	$10.8	$8.4	$8.5	$52.4
Equipment	$23.8	$0.0	$0.0	$0.0	$0.0	$23.8
SUBTOTAL	$151.4	$141.4	$139.0	$104.6	$87.2	$623.5
General Administration (9% of subtotal)	$13.6	$12.7	$12.5	$9.4	$7.8	$56.1
PROJECT TOTAL	$165.0	$154.1	$151.6	$114.0	$95.0	$679.6
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

In-Kind contributions: FY12 - FY16: $600.0 K in NOAA System-Wide Monitoring Program ($120.0K/year)
FY12 - FY16: $25.0K in CTD equipment ($5.0K/year)

FY12-16

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4A
TRUSTEE AGENCY
SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Doroff, Angela	Long-term monitoring of marine conditions	3.0	8.0		24.0
Fishery Biologist		6.0	7.0		42.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	15.0	0.0	
				Personnel Total	$66.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium - F&G	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - F&G	0.1	6			0.5
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.7

FY12

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Calibration and repair	0.5
Shipping - samples	1.3
Boat charters	48.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$49.8

Commodities Costs: Description	Commodities Sum
Boat fuel and repair	8.1
Commodities Total	$8.1

FY12

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Equipment	2.0	11.9	23.8
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
New Equipment Total			$23.8

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B
EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Doroff, Angela		3.0	8.4	0.0	25.2
Fishery Biologist		6.0	7.4	0.0	44.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	15.8	0.0	
				Personnel Total	$69.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium - F&G	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - F&G	0.1	6			0.5
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.7

FY13

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Calibration and repair	2.5
Shipping - samples	1.3
Boat charter	48.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$51.8

Commodities Costs: Description	Commodities Sum
Boat fuel and repair	7.7
Probes	2.9
Sensors/probes	6.0
Commodities Total	$16.6

FY13

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B
EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Doroff, Angela		3.0	8.8	0.0	26.5
Fishery Biologist		6.0	7.7	0.0	46.3
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	16.5	0.0	
				Personnel Total	$72.8

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium - F&G	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - F&G	0.1	6			0.5
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.7

FY14

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B
PERSONNEL &
TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Calibration and repair	2.5
Shipping - samples	1.3
Boat Charters	48.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$51.8

Commodities Costs: Description	Commodities Sum
Boat fuel and repair	7.7
Probes	3.1
Commodities Total	$10.8

FY14	Program Title: Long-Term Monitoring Team Leader: Angela Doroff Agency: Fish & Game/SF/KBRR	FORM 4B CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B
EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Doroff, Angela		3.0	9.3	0.0	27.8
Fishery Biologist		4.5	8.1	0.0	36.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	17.4	0.0	
				Personnel Total	$64.2

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium - F&G	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - F&G	0.1	6			0.5
National Conference - F&G	1.2	1	5	0.3	2.5
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$6.1

FY15

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Calibration and repair	2.5
Shipping - samples	1.3
Boat charter	22.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$25.8

Commodities Costs: Description	Commodities Sum
Boat fuel and repair	6.5
Probes	1.9
Commodities Total	$8.4

FY15

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B
EQUIPMENT DETAIL

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Doroff, Angela		3.0	9.7	0.0	29.2
Fishery Biologist		4.0	8.5		34.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	18.2	0.0	
				Personnel Total	$63.2

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium - F&G	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - F&G	0.1	6			0.5
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.7

FY16

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Calibration and repair	2.5
Shipping - samples	1.3
Boat charter	8.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$11.8

Commodities Costs: Description	Commodities Sum
Boat fuel and repair	6.5
Probes	2.0
Commodities Total	$8.5

FY16

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$4.2	$4.2	$4.2	$6.6	$4.2	$23.3
Contractual	$2.5	$2.5	$2.5	$2.5	$2.5	$12.5
Commodities	$13.0	$7.0	$7.0	$9.0	$6.0	$42.0
Equipment	$5.0	$7.7	$0.0	$0.0	$0.0	$12.7
SUBTOTAL	$24.7	$21.4	$13.7	$18.1	$12.7	$90.5
General Administration (9% of subtotal)	$2.2	$1.9	$1.2	$1.6	$1.1	$8.1
PROJECT TOTAL	$26.9	$23.3	$14.9	$19.7	$13.8	$98.6
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

In-Kind contributions: FY12 - FY16: $25.0K in CTD equipment ($5.0K/year)
FY12 - FY16: $125.0K in salary support for Kris Holderied and KBL Staff ($25.0K/year)

FY12-16

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4A
TRUSTEE AGENCY
SUMMARY

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Syposium - NOAA	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - NOAA	0.1	12			1.0
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$4.2

FY12

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Calibration and repair	2.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$2.5

Commodities Costs: Description	Commodities Sum
Supplies	3.0
KBL Computer	5.0
KBL boat fuel	5.0
Commodities Total	$13.0

FY12

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
CTD sensors	1.0	5.0	5.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$5.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
				0.0	0.0
				0.0	0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Syposium - NOAA	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - NOAA	0.1	12			1.0
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$4.2

FY13

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Calibration and repair	2.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$2.5

Commodities Costs: Description	Commodities Sum
Supplies	2.0
KBL boat fuel	5.0
Commodities Total	$7.0

FY13

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
CTD Sensors	1.0	7.7	7.7
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$7.7

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs: Name	Project Title	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
				0.0	0.0
				0.0	0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
Marine Science Syposium - NOAA	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - NOAA	0.1	12			1.0
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$4.2

FY14

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Calibration and repair	2.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$2.5

Commodities Costs: Description	Commodities Sum
Supplies	2.0
KBL boat fuel	5.0
Commodities Total	$7.0

FY14

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
				0.0	0.0
				0.0	0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Syposium - NOAA	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - NOAA	0.1	12			1.0
National Conference - NOAA	1.2	1	5	0.3	2.5
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$6.6

FY15

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Calibration and repair	2.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$2.5

Commodities Costs: Description	Commodities Sum
Supplies	1.0
KBL Computer	3.0
KBL boat fuel	5.0
Commodities Total	$9.0

FY15

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
				0.0	0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Syposium - NOAA	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - NOAA	0.1	12			1.0
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$4.2

FY16

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Calibration and repair	2.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$2.5

Commodities Costs: Description	Commodities Sum
Supplies	1.0
KBL boat fuel	5.0
Commodities Total	$6.0

FY16

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long term monitoring: Program management component – Science Coordination and Synthesis for the Long Term Monitoring Program

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Kris Holderied, NOAA Kasistna Bay Laboratory
Kris.Holderied@noaa.gov, 907-235-4004, 2181 Kachemak Drive, Homer, AK 99603

Study Location: Prince William Sound, Gulf of Alaska shelf along the outer Kenai Peninsula coast, and lower Cook Inlet/Kachemak Bay, Alaska

Abstract:
This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et al. Long-term monitoring has been implemented within the *Exxon Valdez* Oil Spill (EVOS)-affected region, with support from the EVOS Trustee Council (TC), agencies, North Pacific Research Board, Alaska Ocean Observing System, other research grant organizations, and citizen science programs. However, many of these efforts have been conducted independently, with emphasis on monitoring of single species or within individual disciplines. By explicitly providing for science coordination and syntheses of data from our proposed long-term monitoring program, as well as incorporating an interdisciplinary framework into program development and implementation, we seek to improve open access to multi-disciplinary data and promote use of integrated information from the entire program for both research and resource management in the EVOS-affected region. The science coordination and synthesis component of our integrated program will improve linkages between monitoring in different regions (Prince William Sound, Gulf of Alaska shelf, lower Cook Inlet) as well as between disciplines in a given region, as a way to better discern the impacts of environmental change on restoration and continued recovery of injured resources. Science coordination will include facilitating program planning and sharing of information between principal investigators, developing annual reports on the science program, and coordinating ongoing evaluation of the overall program. Science synthesis efforts will help integrate information across the entire program and will be closely coordinated with the conceptual ecological modeling and data management teams in our integrated program.

Estimated Budget:
EVOSTC Funding Requested: (does not include 9% Trustee Agency G&A):
FY12: $113.3; FY13: $127.5; FY14: $136.1; FY15:$134.0; FY16: $139.1
TOTAL: $650.0
Non-EVOSTC Funds to be used: (in-kind contribution)
FY12: $13.0; FY13: $13.0; FY14: $13.0; FY15: $13.0; FY16: $13.0
TOTAL: $65.0

Date: June 1, 2011

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

In the two decades following the *Exxon Valdez* oil spill (EVOS), and after extensive restoration, research and monitoring efforts, it has been recognized that full recovery from the spill will take decades and requires long-term monitoring of both the injured resources and factors other than residual oil that may continue to inhibit recovery or adversely impact resources that have recovered. Monitoring information is valuable for assessing recovery of injured species, managing those resources and the services they provide, and informing the communities who depend on the resources. In addition, long-term, consistent, scientific data is critical to allow us to detect and understand ecosystem changes and shifts that directly or indirectly (e.g. through food web relationships) influence the species and services injured by the spill.

An integrated monitoring program requires information on environmental drivers and pelagic and benthic components of the marine ecosystem. Additionally, while extensive monitoring data has been collected thus far through EVOS Trustee Council (TC)-funded projects as well as from other sources and made publicly available, much of that information needs to be assessed holistically to understand the range of factors affecting individual species and the ecosystem as a whole. Interdisciplinary syntheses of historical and ongoing monitoring data are required to answer remaining questions about the recovery of injured resources and impacts of ecosystem change.

The overarching goal of the long-term monitoring program is to provide sound scientific data and products to inform management agencies and the public of changes in the environment and the impacts of these changes on injured resources and services. The science coordination and synthesis effort will support this goal by documenting the overall science monitoring program, improving information sharing between PIs and with the herring program, assisting in development of multi-disciplinary datasets and tools, and informing an ongoing evaluation of the long term monitoring program's effectiveness and priorities in meeting EVOS TC goals.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," and submitted by McCammon et al.

II. PROJECT DESIGN
A. Objectives

1. *Improve* ***communication*****,** ***data sharing and*** *coordinated field work* ***planning*** *between principal investigators (PIs) of the individual monitoring projects, as well as with other agencies and research organizations;*

2. *Improve and document* ***integration of science monitoring*** *results across the LTM program* - working with the PIs, data management and modeling teams as well as other agencies and research organizations; and

3. *Improve* ***communication of monitoring information*** *to resource managers and the public through data synthesis and visualization products and tools* – working with the data management, conceptual ecological modeling and outreach teams, as well as other agencies and research organizations.

Science coordination and synthesis efforts will be closely coordinated with and informed by our LTM program administration, data management, conceptual ecological modeling and outreach efforts, as well as by planning and results from the EVOSTC-funded herring program. As outlined in the proposal submitted by McCammon et al., the science synthesis effort of our LTM program will also help fill a coordination gap between science and monitoring programs in the spill-affected region, specifically including the North Pacific Research Board (NPRB) Gulf of Alaska Integrated Ecosystem Research Program (GOAIERP), the National Park Service (NPS) Inventory and Monitoring Program, other agency monitoring programs, separately-funded projects of the Alaska Ocean Observing System (AOOS), and multi-agency and university collaborative programs such as the Geographic Information Network of Alaska (GINA), Alaska Statewide Digital Mapping Initiative (SDMI) and Landscape Conservation Cooperatives (LCCs).

B. Procedural and Scientific Methods

Kris Holderied will serve as the science lead for the LTM program and contribute approximately one month of in-kind labor to program coordination and synthesis efforts. Upon approval of funding by the EVOSTC, a full-time science coordinator will be hired to conduct the bulk of science coordination and synthesis efforts proposed here. Labor rates for the science coordinator are escalated by approximately 3% each year. Funding is also requested for office space, computers and supplies for the science coordinator and travel for the science lead and science coordinator. Please see detailed budget submission for additional information.

<u>*Objective 1*</u>*: Improve data sharing and coordinated field work planning between PIs of the individual monitoring projects, as well as with other agencies and research organizations*

a. Coordinate with Team Lead, PIs, adminstrative team and EVOSTC staff on overall LTM program planning, reporting and evaluation.

b. Plan agenda and facilitate annual PI meeting. Meeting logistics will be handled by the administrative team.

c. Develop and maintain ongoing field work schedule for posting on LTM program website.

d. Coordinate with the herring program lead on program implementation and joint information needs.

e. Coordinate with groups outside the LTM program (NPRB GOAIERP, NPS, GINA, LCCs etc.) on joint synthesis of information.

Objective 2: Improve and document integration of science monitoring results across the LTM program

a. Prepare annual and final reports on overall science monitoring effort, working with the LTM lead (M. McCammon), Administration team, PIs, data management team, and outreach team.

b. Assist data management and conceptual ecological modeling teams with historical data synthesis. Initial emphasis will be on time series within the LTM program, and then expand to other time series. Level of effort required will be evaluated after year 1.

c. Coordinate development of a monitoring data synthesis report for Year 3 joint workshop between LTM and herring programs.

d. Help plan and facilitate Year 3 integrated workshop between LTM and herring programs with LTM lead, administrative team, EVOS TC staff, and herring program lead

e. Coordinate with PIs to improve integration of multi-disciplinary monitoring activities within geographic regions (PWS, outer Kenai Peninsula coast, lower Cook Inlet) and of monitoring within single disciplines between different regions.

f. Assist in development of conceptual ecological models with the modeling team, herring program lead, and outside groups.

Objective 3: Improve communication of monitoring information to resource managers and the public through data synthesis and visualization products and tools

a. Work with data management team, modeling PI, and outreach team to develop data exploration and visualization tools. Initial focus will be to investigate and implement simple tools that are already being used in other monitoring programs. One example would be a simple web-based trend analysis and site comparison visualization tool for physical oceanographic data.

b. Assist in outreach of conceptual ecological models with the modeling team, herring program lead, outreach team, and outside groups.

c. Assist with internal “beta” testing of initial data visualizations and tools developed by the data management team.

d. Network with other monitoring programs and regional stakeholders to identify information needs that may be met by improved data visualization tools for the LTM program data.

Coordination

As described in detail in the summaries for the environmental drivers, benthic and pelagic component plans in Appendix 1 of the proposal submitted by McCammon et al., the monitoring efforts we propose under this program will be closely coordinated with existing monitoring by other agencies and research organizations. We have already contacted many program managers and scientists in these monitoring programs as part of developing our proposal. Some are participating as principal or collaborating investigators on this proposal and others are interested in sharing data and coordinating on monitoring protocols. Some examples include the NPRB GOAIERP, the Alaska Ocean Observing System's GOA programs, National Park Service Inventory and Monitoring Program, Kachemak Bay Research Reserve System-Wide Monitoring Program, Cook Inlet and Prince William Sound Regional Citizens Advisory Council monitoring programs, U.S. Fish and Wildlife sea otter surveys, small mesh trawl fishery surveys conducted by NOAA National Marine Fisheries Service (NMFS) and the Alaska Department of Fish and Game (ADF&G) and new oceanographic monitoring to be conducted by the NMFS Kodiak Laboratory.

Please also see detailed project descriptions for individual monitoring projects, data management efforts and conceptual ecological modeling efforts for more information on the specific scientific and data handling procedures and methods that will be used within our proposed LTM program.

Synthesis

Necessarily, the initial priorities for science synthesis will be to support integration of data collected by project PIs during the initial 5-year program as well as of historical data collected under the same programs in the past. Initial coordination with PIs on availability of historical datasets has confirmed that a significant effort will be required to identify and collect information solely from monitoring projects in our integrated program. The science synthesis and data management teams will work together on that effort, particularly during the first two years of the program. We recognize the need to also integrate data from other research and monitoring programs such as those listed above, and intend to do so to the extent possible within the amount of funds available for the long-term monitoring program. Our data management program will ensure that these other science programs have ready access to information from all projects in our monitoring program.

C. Data Analysis and Statistical Methods

Please see the detailed project descriptions for the Data Management and Conceptual Ecological Modeling components of the integrated long-term monitoring proposal by McCammon et al for details on proposed data analyses. As described above, integration of data between multi-disciplinary projects and helping to provide improved access to that information by PIs, resource managers, coastal planners, the research community and the general public will be the primary focus of the program-wide science synthesis effort.

D. Description of Study Area

The study area will include all areas identified for projects in the environmental, pelagic, and benthic monitoring components of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services" submitted by McCammon et. al.

E. Coordination and Collaboration with Other Efforts

The primary goals of the LTM program science coordination and synthesis efforts are to: 1) support coordination between the EVOSTC-funded LTM projects, 2) facilitate coordination with the EVOSTC-funded herring program, and 3) support collaborations with other efforts, including state and federal agency operations and research programs funded by other organizations such as NPRB. Please see above sections and the schedule below for details.

III. SCHEDULE

A. Project Milestones

Most milestones for the science coordination and synthesis effort will be met each year in an ongoing process.

Objective 1. Improve data sharing and coordinated field work planning between project PIs and other agencies and research organizations.
Annual PI meetings to be conducted each year (tentatively in November)
Initial coordinated field work schedule to be met by April 2012
LTM program update at Alaska Marine Science Symposium each year
Annual LTM proposed workplan submission to be met by June each year

Objective 2. Improve and document integration of science monitoring results across the LTM program.
Annual LTM progress report submission to be met by August each year
Initial synthesis of historical data available in digital format from LTM projects to be met by September 2012
Data synthesis report for Year 3 joint workshop to be met by October 2014

Objective 3. Improve communication of monitoring information to resource managers and the public through data synthesis and visualization products and tools.
Development of initial tool to be met by September 2012
(see Data Management project description for additional milestones)

B. Measurable Project Tasks

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)

Project funding approved by Trustee Council
Conduct PI meeting
Hire science synthesis coordinator
Attend coordination meetings (expected with EVOS TC staff and with administrative, data management and ecological model teams)

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)

Attend Alaska Marine Science Symposium and present on LTM program plan
Initiate collection, with data management team, of historical data from LTM PI projects

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)

Submit proposed workplan for FFY 13
Provide initial coordinated field work schedule to PIs and online.

FFY 12, 4th quarter (July 1, 2012-September 30, 2012)

Submit report on synthesis of historical data that is already available in digital format from the LTM projects
Submit annual report on monitoring efforts in the LTM program

FFY 13 (October 1, 2012-September 30, 2013)

Conduct annual PI meeting, with conceptual modeling workshop during the meeting
Complete first example interactive data visualization tool and continue to assist with development of new data visualization and access tools
Facilitate annual PI meeting
Attend Alaska Marine Science Symposium and provide update on LTM program
Assist in planning of joint LTM-herring program workshop in FFY 14
Submit report on synthesis of all available historical data from LTM projects
Submit proposed work plan for FFY 14
Submit annual report on monitoring efforts in the LTM program

FFY 14 (October 1, 2013-September 30, 2014)

Facilitate joint workshop between LTM and herring program PIs (replaces annual PI meeting)
Continue to assist development of new data visualization and access tools
Attend Alaska Marine Science Symposium and provide update on LTM program
Submit report on updated synthesis of historical data.
Submit proposed work plan for FFY 15
Submit annual report on monitoring efforts in the LTM program

FFY 15 (October 1, 2014-September 30, 2015)

Facilitate annual PI meeting
Continue to assist development of new data visualization and access tools
Attend Alaska Marine Science Symposium and provide update on LTM program
Submit report on updated synthesis of historical data.

Submit proposed work plan for FFY 16
Submit annual report on monitoring efforts in the LTM program

FFY 16 (October 1, 2015-September 30, 2016)
Facilitate annual PI meeting
Continue to assist development of new data visualization and access tools
Attend Alaska Marine Science Symposium and provide update on LTM program
Submit final report on updated synthesis of historical data
Submit proposal for next 5-year LTM program
Submit final report on monitoring efforts in the FFY 12-16 LTM program

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$90.0	$111.6	$115.2	$117.6	$121.2	$555.6
Travel	$10.8	$9.4	$11.4	$9.9	$11.4	$52.9
Contractual	$7.5	$5.5	$5.5	$5.5	$5.5	$29.5
Commodities	$1.0	$1.0	$1.0	$1.0	$1.0	$5.0
Equipment	$4.0	$0.0	$3.0	$0.0	$0.0	$7.0
Indirect Costs (*will vary by proposer*)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
UBTOTAL	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
General	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
CT TOTAL	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Other	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

In-Kind

FY12

Program

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$90.0	$111.6	$115.2	$117.6	$121.2	$555.6
Travel	$10.8	$9.4	$11.4	$9.9	$11.4	$52.9
Contractual	$7.5	$5.5	$5.5	$5.5	$5.5	$29.5
Commodities	$1.0	$1.0	$1.0	$1.0	$1.0	$5.0
Equipment	$4.0	$0.0	$3.0	$0.0	$0.0	$7.0
SUBTOTAL	$113.3	$127.5	$136.1	$134.0	$139.1	$650.0
General Administration (9% of subtotal)	$10.2	$11.5	$12.2	$12.1	$12.5	$58.5
PROJECT TOTAL	$123.5	$139.0	$148.3	$146.1	$151.6	$708.5
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

In-Kind contributions: FY12 - FY16: $65.0K in salary support for Kris Holderied ($13.0K/year)

FY12-16

Program Title: Long-Term Monitoring - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4A
TRUSTEE AGENCY SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Interdisciplinary Physical scientist/ Ecologis	Science coordinator	10.0	9.0		90.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
a		Subtotal	9.0	0.0	
				Personnel Total	$90.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium (2 people for 5 days)	0.3	2	10	0.2	2.6
Coordination mtgs w/EVOSTC and LTM team (2 people/ 2 days @3/yr)	0.3	6	12	0.2	4.2
Principal Investigator Meeting - Anchorage (2 people for 3 days)	0.3	2	6	0.2	1.8
Coordination mtg with Herring Program - Cordova (2 people for 3 days)	0.5	2	6	0.2	2.2
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$10.8

FY12

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Office space rental - Homer	3.5
Computer software licenses (data analysis/visualization)	4.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$7.5

Commodities Costs: Description	Commodities Sum
Supplies	1.0
Commodities Total	$1.0

FY12

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Computer	2.0	2.0	4.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$4.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Interdisciplinary physical scientist/ ecologis	Science coordinator	12.0	9.3		111.6
				0.0	0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	9.3	0.0	
				Personnel Total	$111.6

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium (2 people for 5 days)	0.3	2	10	0.2	2.6
Coordination mtgs w/EVOSTC and LTM team (2 people/ 2 days @2/yr)	0.3	4	8	0.2	2.8
Principal Investigator Meeting - Anchorage (2 people for 3 days)	0.3	2	6	0.2	1.8
Coordination mtg with Herring Program - Cordova (2 people for 3 days)	0.5	2	6	0.2	2.2
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$9.4

FY13

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Office space rental - Homer	3.5
Computer software license update (data analysis/visualization)	2.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$5.5

Commodities Costs: Description	Commodities Sum
Supplies	1.0
Commodities Total	$1.0

FY13

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Physical scientist/ Ecologist	Synthesis coordinator	12.0	9.6	0.0	115.2
				0.0	0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	9.6	0.0	
				Personnel Total	$115.2

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium (2 people for 5 days)	0.4	2	10	0.2	2.7
Coordination mtgs w/EVOSTC and LTM team (2 people/ 2 days @3/yr)	0.4	6	12	0.2	4.5
Principal Investigator Meeting - Anchorage (2 people for 3 days)	0.4	2	6	0.2	1.9
Coordination mtg with Herring Program - Cordova (2 people for 3 days)	0.6	2	6	0.2	2.3
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$11.4

FY14

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Office space rental - Homer	3.5
Computer software license update (data analysis/visualization)	2.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$5.5

Commodities Costs: Description	Commodities Sum
Supplies	1.0
Commodities Total	$1.0

FY14

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Computer workstation	1.0	3.0	3.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$3.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs: Name	Project Title	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
Physical scientist/ Ecologist	Synthesis coordinator	12.0	9.8	0.0	117.6
				0.0	0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	9.8	0.0	
				Personnel Total	$117.6

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
Marine Science Symposium (2 people for 5 days)	0.4	2	10	0.2	2.7
Coordination mtgs w/EVOSTC and LTM team (2 people/ 2 days @2/yr)	0.4	4	8	0.2	3.0
Principal Investigator Meeting - Anchorage (2 people for 3 days)	0.4	2	6	0.2	1.9
Coordination mtg with Herring Program - Cordova (2 people for 3 days)	0.6	2	6	0.2	2.3
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$9.9

FY15

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Office space rental - Homer	3.5
Computer software license update (data analysis/visualization)	2.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$5.5

Commodities Costs: Description	Commodities Sum
Supplies	1.0
Commodities Total	$1.0

FY15

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Physical scientist/ Ecologist	Synthesis coordinator	12.0	10.1	0.0	121.2
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	10.1	0.0	
				Personnel Total	$121.2

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium (2 people for 5 days)	0.4	2	10	0.2	2.7
Coordination mtgs w/EVOSTC and LTM team (2 people/ 2 days @3/yr)	0.4	6	12	0.2	4.5
Principal Investigator Meeting - Anchorage (2 people for 3 days)	0.4	2	6	0.2	1.9
Coordination mtg with Herring Program - Cordova (2 people for 3 days)	0.6	2	6	0.2	2.3
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$11.4

FY16

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Office space rental - Homer	3.5
Computer software license updates (data analysis/visualization)	2.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$5.5

Commodities Costs: Description	Commodities Sum
Supplies	1.0
Commodities Total	$1.0

FY16

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term Monitoring: Synthesis and Conceptual Modeling - Conceptual Ecological Modeling

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Tuula Hollmen, Alaska SeaLife Center and University of Alaska Fairbanks, PO Box 1329, Seward, AK 99664; Phone: 907-224-6323; Fax 907-224-6320; Email: tuulah@alaskasealife.org

Study Location: Prince William Sound, outer Kenai coast, and lower Cook Inlet/Kachemak Bay, Alaska

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al. Under this research project, we will develop conceptual ecological models to support the synthesis and planning relating to the long term monitoring program in Prince William Sound, outer Kenai coast, and lower Cook Inlet/Kachemak Bay. To develop these models, we will summarize system components, processes, and influences into a synthetic framework. The conceptual models will assist in identification of data needs and development of further long term monitoring priorities, and support ecosystem based understanding, monitoring, and management of resources within our study area. The conceptual models will also provide guidance for development of numerical and quantitative models of system function and responses to external influences. Finally, the conceptual models will provide a communication tool among scientists, resource managers, policy-makers, and the general public, and will offer outreach opportunities for our project by using data visualization and interactive web-based tools. Development of conceptual ecological models is a multi-step, iterative process, responding to evolving understanding of the structure and dynamics of the system by revising and refining models throughout the process. Specific steps of the process involve: defining goals and scope of the modeling, summarizing current understanding of system structure and processes, defining environmental and anthropogenic influences included in the modeling, development of relevant hierarchies and submodels, refining models with increased understanding of system function, and development of interactive and visualization tools to provide methods to use models for long term planning, development of hypotheses, data exploration, and outreach.

Estimated Budget: $395.4K total without the 9% GA
EVOSTC Funding Requested: $431K total including the 9% GA

FFY12	FFY13	FFY14	FFY15	FFY16	TOTAL
$83.1K	$91.9K	$95.6K	$78.6K	$81.9K	**$431.0K**

Non-EVOSTC Funds to be used: In-kind support - Computers and software for modeling

Date: May 23, 2011

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

In the two decades following the *Exxon Valdez* oil spill (EVOS), and after extensive restoration, research and monitoring efforts, it has been recognized that full recovery from the spill will take decades and requires long-term monitoring of both the injured resources and factors other than residual oil that may continue to inhibit recovery or adversely impact resources that have recovered. Monitoring information is valuable for assessing recovery of injured species, managing those resources and the services they provide, and informing the communities who depend on the resources. In addition, long-term, consistent, scientific data is critical to allow us to detect and understand ecosystem changes and shifts that directly or indirectly (e.g. through food web relationships) influence the species and services injured by the spill.
An integrated monitoring program requires information on environmental drivers and pelagic and benthic components of the marine ecosystem. Additionally, while extensive monitoring data has been collected thus far through EVOS Trustee Council-funded projects as well as from other sources and made publicly available, much of that information needs to be assessed holistically to understand the range of factors affecting individual species and the ecosystem as a whole. Interdisciplinary syntheses of historical and ongoing monitoring data are needed to answer remaining questions about the recovery of injured resources and impacts of ecosystem change. We propose to develop and implement a long-term monitoring program that meets the need for information to guide restoration activities, including data on the status and condition of resources, whether they are recovering, and what factors may be constraining recovery. The ultimate goal of the long-term monitoring program is to provide sound scientific data and products to inform management agencies and the public of changes in the environment and the impacts of these changes on injured resources and services.

The conceptual ecological modeling component of our study plan will provide a framework for 1. exploration, understanding, and synthesis of key components and processes of our study system, 2. refinement and development of further monitoring strategies, and 3. development of outreach and communication tools among scientists, managers, general public, and other interested parties. The conceptual models are developed to support the synthesis of data and to serve as a framework and guide for development of monitoring priorities, to meet the overall goals of the long term monitoring program.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled “Long-Term Monitoring of Marine Conditions and Injured Resources and Services,” and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

1. *Develop conceptual ecological models, summarizing key components, processes, and functions of the study system*

2. *Develop computer applications and web-based interfaces for interactive data exploration and visualization*

Conceptual ecological models are considered a key element of environmental and biological monitoring programs, and provide a qualitative representation of the structure and dynamic properties of the ecosystem. Models define scope and provide a scientific framework for monitoring programs by describing current understanding of system structure, processes, and function, including key system components and their interactions. Models provide a method to integrate current knowledge of the system originating from a variety of data sources, such us multiple long term studies focusing on different species or components of the system. Models provide critical tools to address uncertainties or incomplete understanding of ecosystem function, and provide the basis for development of causal hypotheses among environmental or anthropogenic stressors, ecological effects, and management actions.

Conceptual models provide tools for further development of long term plans in multiple ways. Models can be utilized to identify information needs and suitable indicators for further development and design of long term monitoring plans. Conceptual, qualitative models facilitate further development of quantitative data models (such as predictive scenario models). Conceptual models provide support tools for restoration planning, and can be used as a basis for management analyses to assess risk reduction and system recovery from pertubations.

Conceptual models provide a schematic framework to organize and illustrate complex system structure and linkages, thus serving as a tool to facilitate understanding and communication among scientists, managers, and the public. Development of interactive data exploration and visualization tools facilitates outreach, education, and communication through web-based applications and presentations. The interactive tools can also be offered for resource managers, policy-makers, general public, and other interested audiences to share data and to explore ecological processes within the study system. The interactive tools can be tailored at different levels of technical complexity to meet the needs of various audiences.

B. Procedural and Scientific Methods

1. *Develop conceptual ecological models, summarizing key components, processes, and functions of the study system*

   Development of conceptual ecological models to support synthesis and planning of the long term monitoring program is a multi-phase process. The goals and scope of the modeling effort will be defined at the start of the process.   The scope of the modeling effort is also defined at the start of the process, involving an ecological site description and definition of spatial and temporal scales. Scales may be incorporated in a hierarchical manner, allowing for specific components of the system to be modeled at different levels of detail (ie. macromodels vs subsystem models). Identification of key components, processes, and functions of the system will be a key step involving the PIs of the benthic, pelagic, and environmental components of the project, and coordination with other scientists and groups with expertise relating to the study system. Our primary study area within the Gulf of Alaska is part of a larger oceanic ecosystem and linked to terrestrial systems, and consideration of influences by wider scale ecological and anthropogenic processes will be part of the model construction process. At the start, this information will reflect the status of the current knowledge of the system, and will be refined as understanding of the system evolves through the research program and collaborations with other programs.

The basic conceptual model will represent the structure, processes, and key interactions of the system. Models to demonstrate knowledge and hypotheses about linkages between specific stressors (environmental and/or anthropogenic) and ecological responses can be incorporated into the system models, and may include a subset of system components. Alterative models and hierarchical (sub)models will be used to address specific goals and needs of the long term research program and further development of monitoring strategies.

The development of the conceptual model(s) is a multi-step, iterative process, responding to evolving understanding of the structure and dynamics of the system by revising and refining models throughout the process. A working group involving scientists with expertise on the physical and biological components of the system, modelers, and other appropriate parties (including resource managers) will be convened to support the development of the conceptual models at all stages of the process. PIs of the environmental and biological components of the monitoring program will have a key role for input in model development, and external collaborators will be involved with specific components of the model. The team will conduct a workshop at the beginning of FFY13 and will hold additional meetings during various stages of the model development. The efforts will be coordinated by the PI of the modeling task.

2. *Develop computer applications and web-based interfaces for interactive data exploration and visualization*

Conceptual models are suited for interactive web-based presentation to offer data exploration and visualization tools to audiences at different levels of technical expertise related to the computations behind the models. We propose to develop such applications to facilitate web-based outreach about the progress of our project and, ultimately, to offer user-friendly and interactive tools that can be tailored to specific audiences with interest in the ecological processes of our study area. These tools will help multiple users visualize the current state and potential future states of the ecosystem. Visualization products are developed using multiple approaches, including mapping and diagrams. Interactive data exploration tools can be produced at different levels of computational and output complexity, and we propose to begin the development of simple interactive tools representing selected components of the monitoring programs to facilitate outreach and communication efforts for our program. At a later phase, a more comprehensive interactive data exploration modeling tool can be developed and delivered through our project website or other relevant outlets.

C. Data Analysis and Statistical Methods

The conceptual ecological modeling will mostly involve qualitative analyses and synthesis of ecosystem components and processes for a conceptual representation of the study system. Existing data and knowledge of the system will be used to construct the models. Analytical and visualization tools and methods include structural and influence diagrams, tabulated data, narratives, spatial maps, and mathematical modeling. Similar tools will be used for the development of web-based visualization products and data exploration tools, with programming and computational designs to facilitate access and use by audiences with multiple levels of technical background. These tools may be designed to facilitate multi-directional data sharing, for example, facilitating citizen science and volunteer based reporting of data.

Applications will be developed for shared data store to facilitate and support scientific networking, and communication of our research and results through web-based outreach. Development and visualization of conceptual models utilize either existing software packages designed to create and digitize conceptual models, or by programming elements of the models or related interactive tools. For programming, we will use an object-oriented programming language with a graphical user interface to provide a visual representation of the system in a web-based application. The application will allow users to access the web-interface model and supporting documents, pictures, and movies directly from the internet. Hierarchical representation of spatial features and biological inputs allow for flexibility of user-driven inputs and expected output. We will use two- and three-dimensional mapping applications to deliver geographical representations of model components and output.

D. Description of Study Area

The study area will be the same as for the environmental, pelagic, and benthic monitoring components. Please see Figure 1 on page 19 of the integrated proposal titled “Long-Term Monitoring of Marine Conditions and Injured Resources and Services,” and submitted by McCammon et. al.

E. Coordination and Collaboration with Other Efforts

The modeling project will be closely coordinated with the science synthesis and the long term monitoring projects proposed for this integrated study, including pelagic, benthic, and environmental components. The PI of the model development task will work closely with the Science Team Leader, attend the annual PI meetings, and coordinate additional meetings and a workshop to interact and coordinate input from PIs of the monitoring components. Furthermore, modeling efforts will be closely coordinated with other existing monitoring and ecological research programs, including the Gulf of Alaska Integrated Ecosystem Research Program funded by the North Pacific Research Board, and the Vital Signs Monitoring Program by the National Park Service. Development of web-based applications will be coordinated with other science and outreach team members of our program.

III. SCHEDULE

A. Project Milestones

Objective 1. Develop a conceptual ecological model of the study system.

Draft conceptual ecosystem model: To be met by October 2013
Conceptual ecosystem model: To be met by June 2016

Objective 2. Develop computer applications and web-based interfaces for interactive data exploration and visualization.

First interactive/data visualization tools: To be met by December 2012
Web based interactive conceptual model: To be met by September 2016

B. Measurable Project Tasks

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)

Attend PI meeting
Develop goals for conceptual models
Identify data and system components for the modeling
Assemble a modeling team

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)

Develop goals for conceptual models
Identify data and system components for the modeling
Assemble a modeling team
Design draft conceptual models
Attend Alaska Marine Science Symposium

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)

Attend annual PI meeting
Design draft conceptual models
Prepare for modeling workshop in FFY 13

FFY 12, 4th quarter (July 1, 2012-September 30, 2012)

Design draft conceptual models
Prepare for modeling workshop in FFY 13
Prepare modeling progress update for annual report

FFY 13, (October 1, 2012-September 30, 2013)

Conduct modeling workshop
Complete first interactive and data visualization tools for selected components
Design draft conceptual models
Continue development of interactive/data visualization tools
Attend annual PI meetings and Alaska Marine Science Symposium
Prepare modeling progress update for annual report

FFY 14, (October 1, 2013-September 30, 2014)

Complete draft conceptual ecosystem models for synthesis report
Continue development of conceptual models
Continue development of interactive/data visualization tools
Attend annual PI meetings and Alaska Marine Science Symposium
Prepare modeling progress update for annual report

FFY 15, (October 1, 2014-September 30, 2015)

Continue development of conceptual models
Continue development of interactive/data visualization tools
Attend annual PI meetings and Alaska Marine Science Symposium
Prepare modeling progress update for annual report

FFY 16, (October 1, 2015-September 30, 2016)

Complete development of conceptual models
Complete development of interactive/data visualization tools
Attend annual PI meetings and Alaska Marine Science Symposium
Prepare modeling results for final report

Alaska SeaLife Center
Budget Justification

Personnel & Fringe

A Research Coordinator (TBD) will dedicate 1 month to the project in Year 1 and 0.5 months in Year 2, and will be responsible for coordinating and preparing for the modeling workshop.

A Post-Doctoral Researcher (TBD) will dedicate 1 month to the project in Year 1, 2 months in Year 2, and 3 months in Years 3-5. The Post-Doc will be responsible for working with PI in all aspects of model construction and development of interactive modeling tools.

A cost of living increase of 5% is included in Years 2-5 for ASLC personnel. ASLC fringe benefits are charged at actual expenses and are estimated at 28% of salary for regular employees. Fringe for regular employees includes the cost of accrued leave, employer contributions to health insurance, required payroll taxes (social security, Medicare, and unemployment), and employer contributions to long-term disability, workers compensation, and other insurance programs.

Personnel and Fringe for PI Hollmen are included below in the Contractual section.

Travel

Travel requested is on an annual basis:

PI Meeting in Anchorage - 1 from out of state, 2 from Seward	
Airfare – Origin TBD to Anchorage, AK x 1 person	$ 800
Per diem/lodging – 2 days/1 night Anchorage, AK @ $225 x 3 ppl	$ 675
Mileage RT Seward – Anchorage @ 300 mi x $0.50/mi x 3ppl	$ 450
Other travel – parking, etc. x 3 ppl	$ 150
	$2,075

Modeling Workshop in ANC - 1 from out of state, 2 from Seward	
Airfare – Origin TBD to Anchorage, AK x 1 person	$ 800
Per diem/lodging – 2 days/1 night Anchorage, AK @ $225 x 3 ppl	$ 675
Mileage RT Seward – Anchorage @ 300 mi x $0.50/mi x 3ppl	$ 450
Other travel – parking, etc. x 3 ppl	$ 150
	$2,075

Alaska Marine Science Symposium – 1 person from Seward	
Per diem/lodging – 6 days/5 nights Anchorage, AK @ $225	$1,350
Mileage RT Seward – Anchorage @ 300 mi x $0.50/mi	$ 150
Other travel – parking, etc.	$ 50
	$1,550

Contractual
PI Hollmén is supported through a contractual arrangement with the University of Alaska Fairbanks. Hollmén will be responsible for overall management and coordination of the conceptual ecological modeling efforts, including model development, workshops, budget management reports and publications. PI will dedicate up to three months per year in Year 1-3, and 2 months per year in Years 4-5.

Commodities
IT hardware, supplies and software relating to model construction, visualization and development of interactive tools will be purchased.

Equipment
No funding is requested for equipment.

Indirect
The Alaska SeaLife Center's 2010 indirect rate is 31.05% of MTDC (modified total direct costs; submitted to the Department of Commerce in April 2010). Equipment and portions of subawards greater than $25,000 are excluded from MTDC.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$10.0	$14.4	$19.2	$20.1	$21.0	$84.7
Travel	$5.7	$5.7	$5.7	$5.7	$5.7	$28.5
Contractual	$38.4	$40.2	$42.0	$29.2	$30.6	$180.4
Commodities	$4.0	$4.0	$0.0	$0.0	$0.0	$8.0
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$18.1	$20.0	$20.8	$17.1	$17.8	$93.8
SUBTOTAL	$76.2	$84.3	$87.7	$72.1	$75.1	$395.4
General Administration (9% of subtotal)	$6.9	$7.6	$7.9	$6.5	$6.8	$35.6
PROJECT TOTAL	$83.1	$91.9	$95.6	$78.6	$81.9	$431.0
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In this box, identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

FY12-16

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$10.0	$14.4	$19.2	$20.1	$21.0	**$84.7**
Travel	$5.7	$5.7	$5.7	$5.7	$5.7	**$28.5**
Contractual	$38.4	$40.2	$42.0	$29.2	$30.6	**$180.4**
Commodities	$4.0	$4.0	$0.0	$0.0	$0.0	**$8.0**
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**
Indirect Costs (*will vary by proposer*)	$18.1	$20.0	$20.8	$17.1	$17.8	**$93.8**
SUBTOTAL	$76.2	$84.3	$87.7	$72.1	$75.1	**$395.4**
General Administration (9% of subtotal)	$6.9	$7.6	$7.9	$6.5	$6.8	**$35.6**
PROJECT TOTAL	$83.1	$91.9	$95.6	$78.6	$81.9	**$431.0**
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**

COMMENTS:

FY12-16

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3A
NON-TRUSTEE
AGENCY SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Research Coordinator - TBD	Long-Term Monitoring of Marine Conditions	1.0	4.2		4.2
Post-Doctoral Researcher - TBD	and Injured Resources and Services -	1.0	5.8		5.8
Monthly costs for both positions include	Synthesis Component				0.0
28% fringe benefits					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	10.0	0.0	
				Personnel Total	$10.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
PI meeting in Anchorage	0.8	1	3	0.43	2.08
Modeling Workshop in Anchorage	0.8	1	3	0.43	2.08
Alaska Marine Science Symposium	0.2	1	6	0.23	1.55
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.7

FY12

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Salary Support - PI Tuula Hollmen @ $12,800/mo x 3 months	38.4
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$38.4

Commodities Costs: Description	Commodities Sum
IT & Modeling Supplies	4.0
Commodities Total	$4.0

FY12

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Research Coordinator - TBD	Long-Term Monitoring of Marine Conditions	0.5	4.4		2.2
Post-Doctoral Researcher - TBD	and Injured Resources and Services -	2.0	6.1		12.2
Monthly costs for both positions include	Synthesis Component				0.0
28% fringe benefits					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	10.5	0.0	
				Personnel Total	$14.4

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
PI meeting in Anchorage	0.8	1.0	3.0	0.43	2.08
Modeling Workshop in Anchorage	0.8	1.0	3.0	0.43	2.08
Alaska Marine Science Symposium	0.2	1.0	6.0	0.23	1.55
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.7

FY13

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Salary Support - PI Tuula Hollmen @ $13,400/mo x 3 months	40.2
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$40.2

Commodities Costs: Description	Commodities Sum
IT & Modeling Supplies	4.0
Commodities Total	$4.0

FY13	**Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component** **Team Leader: Tuula Hollmen**	**FORM 3B CONTRACTUAL & COMMODITIES DETAIL**

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
	Long-Term Monitoring of Marine Conditions				0.0
Post-Doctoral Researcher - TBD	and Injured Resources and Services -	3.0	6.4		19.2
	Synthesis Component				0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	6.4	0.0	
				Personnel Total	$19.2

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
PI meeting in Anchorage	0.8	1.0	3.0	0.43	2.1
Modeling Workshop in Anchorage	0.8	1.0	3.0	0.43	2.1
Alaska Marine Science Symposium	0.2	1.0	6.0	0.23	1.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.7

FY14

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Salary Support - PI Tuula Hollmen @ $14,000/mo x 3 months	42.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$42.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY14

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
	Long-Term Monitoring of Marine Conditions				0.0
Post-Doctoral Researcher - TBD	and Injured Resources and Services -	3.0	6.7		20.1
	Synthesis Component				0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	6.7	0.0	
				Personnel Total	$20.1

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
PI meeting in Anchorage	0.8	1.0	3.0	0.43	2.1
Modeling Workshop in Anchorage	0.8	1.0	3.0	0.43	2.1
Alaska Marine Science Symposium	0.2	1.0	6.0	0.23	1.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.7

FY15	**Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component** **Team Leader: Tuula Hollmen**	**FORM 3B PERSONNEL & TRAVEL DETAIL**

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Salary Support - PI Tuula Hollmen @ $14,600/mo x 2 months	29.2
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$29.2

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY15	**Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component** **Team Leader: Tuula Hollmen**	**FORM 3B CONTRACTUAL & COMMODITIES DETAIL**

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
	Long-Term Monitoring of Marine Conditions				0.0
Post-Doctoral Researcher - TBD	and Injured Resources and Services -	3.0	7.0		21.0
	Synthesis Component				0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	7.0	0.0	
				Personnel Total	$21.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
PI meeting in Anchorage	0.8	1.0	3.0	0.43	2.1
Modeling Workshop in Anchorage	0.8	1.0	3.0	0.43	2.1
Alaska Marine Science Symposium	0.2	1.0	6.0	0.23	1.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.7

FY16

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Salary Support - PI Tuula Hollmen @ $15,300/mo x 2 months	30.6
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$30.6

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY16

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B
EQUIPMENT DETAIL

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long term monitoring: Environmental drivers component - The Seward Line: Marine Ecosystem monitoring in the Northern Gulf of Alaska.

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Russell R Hopcroft, Principal Investigator (hopcroft@ims.uaf.edu)

Study Location: North-central coastal Gulf of Alaska, Prince William Sound

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al.
The ocean undergoes year-to-year variability in the physical environment, superimposed on longer-term cycles, and potential long-term trends. These variations influence ocean chemistry, and propagate through the lower trophic levels, ultimately influencing fish, seabirds and marine mammals. Over the past 50 years the Northern Pacific appears to have undergone at least one clear "regime shift", while the last 12 years have seen multi-years shifts of major atmospheric indices, leaving uncertainty about what regime the coastal Gulf of Alaska is currently in. Regime shifts are often expressed as fundamental shifts in ecosystem structure and function, such as the 1976 regime shift that resulted in a change from a shrimp dominated fisheries to one dominated by pollock, salmon and halibut. Long-term observations are also critical to describe the current state, and natural variability inherent in an ecosystem at risk of significant anthropogenic impact. Given the potential for such profound impacts, this proposal seeks to continue multidisciplinary observations which began in 1997 along the Seward Line and in PWS that assess the current state of the Northern Gulf of Alaska, during 2012-2017. Such observations form critical indices of ecosystems status that help us understand some key aspects of the stability or change in upper ecosystems components for both the short and longer-term. By analogy, the weather has been for more than a hundred years, yet regular observations are still needed to know what is happening and what can be expected in the near future.

Estimated Budget:
EVOSTC Funding Requested (including 9% GA):
2012 - $98,104; 2013 - $59,841; 2014 - $100,494; 2015 - $104,007; 2015- $107,703

Non-EVOSTC Funds to be used:
2012 - $200,000; 2013 - $300,000; 2014 - $300,000; 2015 - $300,000; 2015- $300,000
Sources: AOOS, NPRB, NOAA, UAF

Date: May 25, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Long times-series are required for scientists to tease out pattern (and cause) from simple year-to-year variability. Like other regions, the Northern Pacific undergoes significant inter-annual variability, driven partially by variations in major climatic indices (e.g. El Niños, the Pacific Decadal Oscillation). Larger longer-term variations referred to as "regime shifts" have occurred in the past, and will likely occur again. Regime shifts are expressed as fundamental shifts in ecosystem structure and function, such as the 1976 regime shift that resulted in a switch within the Gulf of Alaska from a shrimp-dominated fishery to one dominated by pollock, salmon and halibut. Long-term observations are also critical to describe the current state, and natural variability inherent in an ecosystem at risk of significant anthropogenic impact. Given the potential for such profound impacts, the Seward Line Long-term Observation Program (http://www.sfos.uaf.edu/sewardline/) provides these critical observations on the current state of the Northern Gulf of Alaska ecosystem.

The Seward Line represents the most comprehensive long-term multidisciplinary sampling program in the Coastal Gulf of Alaska that allows observation of changes in the oceanography of this region that is critical to Alaska's fisheries, subsistence and tourist economies. Seward Line observations over the past 13 years have fundamentally revised our understanding of the coastal Gulf of Alaska ecosystem and allow us an appreciation of not only its major properties, but also their inter-annual variability. To date, we have observed both unusually warm and cold years, which influence the timing of the planktonic communities, but not necessarily their ultimate abundance and biomass. The quantity and composition of both late spring and summer zooplankton, appear to be significantly correlated with PWS hatchery Pink Salmon survival in this region; relationships to herring have yet to be explored. Thus, springtime abundance of zooplankton along the Seward Line appears to be an index of generally favorable years for higher trophic levels throughout the Gulf of Alaska. The larger GOA-IERP program, which the Seward Line provides an oceanographic foundation for, will explore broader regional patterns as well as search for relationships between oceanography and other species of forage and commercial fish.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

The scientific purpose of this project is to develop an understanding of the response of this marine ecosystem to climate variability, and provide baselines against which to access any other anthropogenic influences on the GOA ecosystem. Toward this end, the Seward Line cruises on the Gulf of Alaska shelf determine the physical-chemical structure, primary production and the distribution and abundance of zooplankton, along with their seasonal and inter-annual variations. Some of the data is compared with historical data sets whereas other data sets are a product of this continuing systematic sampling effort on this shelf.

Specifically, cruises:

1. Determine thermohaline, velocity, and macro-nutrient structure of the Gulf of Alaska shelf, emphasizing the Seward Line, and Prince William Sound stations (Fig.1).
2. Determine the state of carbonate chemistry (i.e. Ocean acidification)
3. Determine primary production and phytoplankton biomass distribution.
4. Determine the distribution and abundance of zooplankton.
5. Determine rates of growth and egg production of selected key zooplankton species.

B. Procedural and Scientific Methods

Overview

The Seward Line (Fig.1) is a transect of 21 stations stretching from GAK1 at the mouth of Resurrection Bay (Seward, Alaska) southward approximately 150 miles to beyond the continental shelf, augmented by 11 stations in Prince William Sound. From 1998-2004, cruises occurred 6-7 times annually. From 2005 onward the program consists of two cruises each year, in early May and early September, to capture the typical spring bloom and stabilized summer conditions, respectively. Using the USFWS vessel *Tiglax*, we determine the physical-chemical structure, algal biomass, primary (algal) production, and the distribution, abundance, biomass and productivity of zooplankton (using 2 different net types). We explore seasonal and inter-annual variations, seeking to understand how different climatic conditions influence the biological conditions in each of these years. Since in 2007 we have also monitored carbonate chemistry (i.e. ocean acidity). With EVOS support we will commence routine sampling at an additional 5-9 stations in the northern and eastern PWS, some of which have been sampled intermittently by the Seward Line program. Patterns emerging from the time series and results from each cruise are posted online at http://www.sfos.uaf.edu/sewardline/ as they become available.

General Considerations

For a long-term observation series, one of the most critical requirements is consistency of sampling locations, timing of observations and methodology. We propose to employ the same set of 13 primary and 9 secondary stations along the Seward Line sampled by the GLOBEC program, which extends from the coast, across the shelf break, to the inner portion of the Alaska Stream (Fig.1). Prince William Sound represents not only a unique habitat but a key “upstream” source to the line. For over a decade we have sampled 3 Knight Island Passage stations and Montague

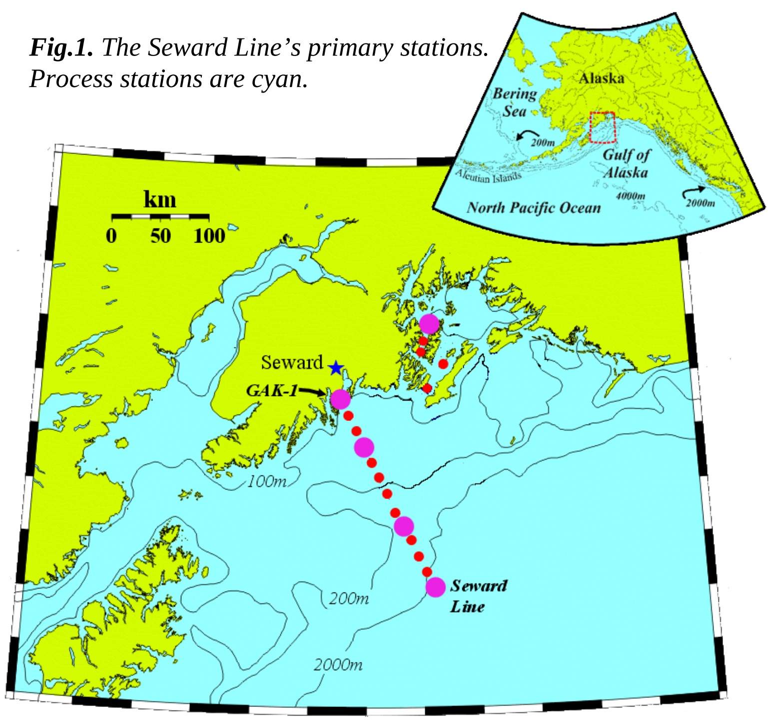


Fig.1. *The Seward Line’s primary stations. Process stations are cyan.*

Strait, beginning in 2012 we will add additional station in northern and eastern PWS as well as stations across Hinchinbrook Entrance. Sampling will be conducted on 8-day cruises from the R/V *Tiglax* (home-ported in Homer) in May and early September. The early May period is consistent with sampling form 1998-2006, while the early September period captures late summer conditions as observed in 2005- 2011, but is slightly later than during the GLOBEC program. The shift to September has been necessitated by the availability of the *Tiglax*. Oceanographic sampling methodology will be close to that employed during the previous 7 years of the Gulf of Alaska GLOBEC LTOP program (i.e. U.S. GLOBEC, 1996; Weingartner *et al.*, 2002), and identical to employed during 2005-2009.

Physical, Chemical, and Phytoplankton

Weingartner is responsible for the physical measurements and Whitledge is responsible for the nutrient, chlorophyll, and primary production measurements. Mathis is responsible for measuring carbonate chemistry. Shipboard measurements include CTD fluorescence, PAR and discrete bottle samples for nutrients and chlorophyll. UAF provides a hydrographic winch with a conducting cable to the ship to facilitate sampling.

Nutrient measurements are made post-cruise on frozen samples using an Alpkem Rapid Flow Analyzer (Whitledge *et al.*, 1981) and will conform to WOCE standards (Gordon *et al.*, 1993). Tests of frozen versus refrigerated samples have indicated no significant difference between storage methods. Analytical precision for triplicate nutrient measurements is approximately 0.03-0.05 µmoles kg^{-1}. *Chlorophyll a* concentrations will be measured at all stations to calibrate the *in vivo* fluorescence profiles. The samples will be collected with the rosette on up-casts. Extracted chlorophyll *a* will be determined fluorometrically post-cruise (Parsons *et al.*, 1984).

Daily measurement of primary production rates will be estimated for large (>20 µm) and small (< 20 µm) size classes by the modified ^{14}C-uptake technique (Parsons *et al.*, 1984). Primary production estimates will be made at 4 stations along the Seward Line, plus one in the sound. Water samples inoculated with ^{13}C-labeled Na_2CO_3 will be incubated in 1-liter polycarbonate bottles under natural light conditions on-deck. Following the incubations, both light and dark bottles will be filtered, purged of inorganic carbon, and analyzed by mass spectrometry. Hourly and daily estimates of primary production rates will be calculated for each sample site. Particulate carbon and nitrogen samples will be obtained for each productivity sample.

We will collect samples at 26 CTD hydro-stations at approximately 5 km spacing along the Seward Line starting at GAK 1 and terminating at roughly to the 2,000 m isobath (GAK 13). We will also sample 15-20 stations inside Prince William Sound, particularly near major glacial outflows. We will use a rosette with 12L Niskin bottles and samples will be collected from the surface to the bottom at all locations. We anticipate collecting approximately 850 samples per cruise from the water column and another 300 underway samples. These measurements will be taken from a Sea-Bird 911+ CTD package that will be calibrated before and after the cruise and will have dual temperature and salinity sensors. The CTD package will also have a DO sensor and will be calibrated using discrete DO measurements by Mathis.

Dissolved oxygen (DO) will be sampled and processed before all other measurements to avoid compromising the samples by atmospheric gas exchange. Oxygen samples will be drawn into individual 115 ml BOD flasks, rinsed with 4-5 volumes of sample, and analyzed using an automated Winkler titration method. Samples are usually analyzed within 24 hours. The use of the UV endpoint detector will allow for increased precision (<0.08%; <0.3 µmoles kg^{-1}).

DIC and TA samples, which will be used to quantify carbonate chemistry and ocean acidification in the region will be fixed with a saturated mercuric chloride solution (200 µl), the bottles sealed, and stored until analysis. When possible, TA samples will be analyzed onboard, otherwise stored after being poisoned with $HgCl_2$. Samples will be shipped to UAF for analysis. High-quality DIC data is achieved using a highly precise (0.02%; 0.4 µmoles kg^{-1}) VINDTA 3C-coulometer system. TA is determined by potentiometric titration with a precision of ~1 µmoles kg-1. Highly accurate DIC and TA is calibrated by routine analysis of seawater certified reference materials (prepared and distributed by Andrew Dickson, UCSD), thereby providing the highest possible accuracy. The remaining carbonate parameters (pCO_2, pH, carbonate mineral saturation states) will be calculated from DIC and TA using the CO_2 SYS program (Lewis and Wallace, 1995).

The physical and chemical data will be used to quantify the seasonal, interannual, and along- and cross-shelf distributions of water masses and their variability. The data will be used along with historical data from this region (i.e. LTOP plus temperature and salinity record at GAK1 since 1970) to examine spatial and temporal variations in both physical and chemical variables and processes. Inter-decadal time scales will also be addressed through the use of sea surface temperatures (available from Scripps since 1947), Sitka air temperatures (since 1828), upwelling indices (from the Pacific Oceanographic Group/NOAA since 1946), the Pacific Decadal Oscillation (since 1900), oceanographic buoy data (from NOAA since ca. 1975) and the EVOSTC-supported continuous measurements at GAK1.

Zooplankton

Coyle and Hopcroft are responsible for the zooplankton component. Hopcroft will assume responsibility for daytime operations (finer meshed vertical plankton nets, copepod incubations) and Coyle will assume responsibility for night-time operations (Multinet collections).

<u>Plankton nets:</u> Day time zooplankton samples will be collected with a Quad net consisting of 25 cm diameter nets of 1.6 m length equipped with GO flowmeters. A pair of these nets is constructed of 0.15 mm mesh and will sample small, primarily early copepodid stages of calanoids (e.g., Coyle *et al.*, 1990; Coyle & Pinchuk, 2003), while nauplii and the smallest copepodid stages of neritic species will be sampled with the pair constructed of 0.05 mm mesh. The tows will be made from 100 m to the surface at the 13 stations along the Seward Line. A 0.25-m^2 Hydrobios Multinet system with 0.5 mm mesh nets will be fished at night to assess large zooplankton and micronekton, such as euphausiids that are important components in the diet of many fish, sea-birds and marine mammals. The Multinet is equipped with five nets that can be programmed to open and close at specific depths, or opened and closed electronically from the deck if a conducting cable is available. Depth, flow meter counts, and volume filtered are recorded at 1 second intervals. The nets will be fished at each of the 13 main Seward Line stations (Fig. 3), plus the 3 stations within Prince William Sound. At each station, 5 samples will be collected at 20 m depth intervals from 100 m depth to the surface. Additional Multinet collections will be made to 600m at Gak13 and PWS2 to assess over-wintering populations of *Neocalanus* spp. All zooplankton samples will be preserved in 10% formalin for later analysis by LTOP methods to the lowest taxonomic category possible. Analysis to date indicates the Multinet yields collections consistent with those obtained using a MOCNESS from 1997-2004.

During traditional taxonomic processing, all larger organisms (primarily shrimp and jelly fish) will be removed and enumerated, the sample will then be Folsom split until the smallest subsample contains about 100 specimens of the most abundant taxa. The most abundant taxa will be identified, copepodites staged, measured, enumerated and weighed with each larger subsample examined for the larger, less abundant taxa. Blotted wet weights of all specimens of each taxa and stage will be taken on each sample with ±1 μg with a Cahn Electrobalance until weights stabilize, after which point the wet weight biomass will be estimated using mean wet weight. Wet weights on euphausiids, shrimp and other larger taxa are always measured and recorded individually for each sample.

Growth/reproduction (Hopcroft) Ongoing changes in the Gulf of Alaska will likely be a reflection of underlying change in the rates of growth and reproduction experienced by the most dominant components of the zooplankton. In the Gulf of Alaska, biomass is seasonally dominated by the large *Neocalanus* spp., although on average they may be exceeded in terms of biomass and production by *Pseudocalanus* species (Coyle & Pinchuk, 2003, 2005). We propose to work with both these species, collected using fine mesh nets at 4 stations spaced along the Seward Line, plus one inside the sound, as was done in the GLOBEC program (e.g. Napp *et al.*, 2005; Liu & Hopcroft, 2006). For *Pseudocalanus,* we propose to monitor egg production rate (EPR), because it appears to be generally reflective of somatic growth of prior developmental stages for these species in this ecosystem (Liu & Hopcroft, 2006b, 2007, 2008), and EPR generally reflects the current food climate (Runge & Roff, 2000). For these experiments, 100 females representing a mixture of the *P. mimus* and *P. newmani* are incubated individually in 70 ml flasks, and the number of eggs produced over 2 days by each population is determined (Napp *et al.*, 2005). In contrast, *Neocalanus* only spawn at great depth during the winter months, thus we must directly assess the growth rates. In this case, single stages of *Neocalanus flemingeri* are selected and incubated at low densities in 20L carboys (with natural food concentration) for 4-5 days, harvested, preserved, and the increase in stage and size later determined from the samples (Liu & Hopcroft, 2006). If time permits, EPR may also be determined for other important species (e.g. *Metridia pacifica* – Hopcroft *et al.*, 2005).

C. Data Analysis and Statistical Methods

The data undergo various forms of quality control during processing. Ultimately, data sets are uploaded to a Microsoft Access database for sorting and analysis, with data and metadata supplied to the consortium's members. The fist analytical pass is visual presentation of the data, and recalculation of long-term means, confidence intervals, and anomalies. Statistically distinct years or periods can already be identified. For biological data, multidimensional scaling of percentage dissimilarities between samples has proven an effective method of revealing cross-shelf patterns (Coyle & Pinchuk, 2005), but becomes complicated when making seasonal or inter-annual comparisons. A variety approaches to separate cyclic and long-term trends continue to be explored, but are hampered by the somewhat stochastic pattern of climate indices – truly long-term (i.e. multi-decadal) observations are required for some of these patterns to emerge.

D. Description of Study Area

See above.

E. Coordination and Collaboration with Other Efforts

Project Integration: This project links tightly with the GAK1 mooring, providing a cross shelf context for its observations. It complements the CPR, PWS, and Lower Cook Inlet/Kachemak Bay long-term monitoring efforts by providing more detailed oceanographic evaluation of the GOA shelf and the major passages in PWS than provided by the other programs. All of these components overlap in their sampling locations relatively little, enough to ensure comparability between datasets, but not enough to be duplicative. The Seward Line cruises are timed to capture the 2 dominate states of this ecosystem at high resolution: the spring bloom and the more oligotrophic late summer. Notably, the Seward Line cruises have been monitoring Montague Strait, as requested by the RFP, since its inception.

Leveraging: This proposal seeks for EVOS to join the consortium of NPRB, AOOS and NOAA currently funding the line. We propose to add additional sampling (the central sound and Hinchinbrook Entrance) to provide more extensive representation of PWS. Full annual costs are ~400K including ship time, thus the 4 members of the consortium should each contribute ~100K per year. Substantial cost saving are anticipated in 2013 when NPRB's GOA-IERP program will cover a larger-than-normal share of the annual funding as well as provide larger sampling context throughout the Gulf of Alaska Shelf. The proposal also leverages on the consolidation of historical and contemporary information in the Gulf of Alaska planned through GOA-IERP program.

III. SCHEDULE

A. Project Milestones

As with most long-term observation programs, the Seward Line has the same Milestones annually.

Objectives 1-5. Cruises are executed early each May and in mid September collecting data or samples to address all objectives each cruise. Products associated with each objective are subsequently posted graphically to the project's website at various intervals reflecting the degree or post-processing required. Final datasets are released annually.

Typically:

- Physical oceanography and chlorophyll are posted 60 days after a cruise.
- DIC and TA are posted 90 days after a cruise.
- Macronutrients and zooplankton are posted 6 months after a cruise.
- Results are presented annually at the Alaska Marine Science Symposium

B. Measurable Project Tasks

FFY, 3rd quarter (April 1-June 30)

May	*Spring Cruise*

FFY, 4th quarter (July 1-September 30)

July	*Spring Cruise physical data and chlorophyll figures on web-site*
August	*DIC and TA figures on web-site*
September	*Late summer Cruise*

FFY, 1st quarter (October 1-December 31)

November	*Spring macronutrients and zooplankton figures on web-site*
November	*Late-summer physical data and chlorophyll figures on web-site*
December	*Late-summer DIC and TA figures on web-site*

FFY, 2nd quarter (January 1-March 31)

January	*Annual Marine Science Symposium*
March	*Late-summer macronutrients and zooplankton figures on web-site*

Presentations are anticipated annually at ASLO, OS or AGU meetings.
First peer-reviewed manuscripts submitted in Third fiscal year, and annually thereafter.

REFERENCES

Coyle, K.O., Paul, A.J. & Ziemann, D.A. (1990) Copepod populations during the spring bloom in an Alaskan subarctic embayment. *J. Plankton Res.*, **12**, 759-797.

Coyle, K.O. & Pinchuk, A.I. (2003) Annual cycle of zooplankton abundance, biomass and production on the northern Gulf of Alaska shelf, October 1997 through October 2000. *Fish. Oceanogr.*, **12**, 227-251.

Coyle, K.O. & Pinchuk, A.I. (2005) Cross-shelf distribution of zooplankton relative to water masses on the northern Gulf of Alaska shelf. *Deep-Sea Res. II.*, **52**, 217-245.

Gordon, C., Jennings, A.A. & Krest, J.M. (1993) A suggested protocol for continuous flow automated analysis of seawater nutrients (phosphate, nitrate, nitrite, and silicic acid) in the WOCE Hydrographic Program and the Joint Global Ocean Fluxes Study. pp. 51, Oregon State University, Corvalis.

Hopcroft, R.R., Pinchuk, A.I., Byrd, A. & Clarke, C. (2005) The paradox of *Metridia* spp. egg production rates: A new technique and measurements from the coastal Gulf of Alaska. *Mar. Ecol. Prog. Ser.*, **286**, 193-201.

Liu, H. & Hopcroft, R.R. (2006a) Growth and development of *Neocalanus flemingeri/plumchrus* in the northern Gulf of Alaska: validation of the artificial cohort method in cold waters. *J. Plankton Res.*, **28**, 87-101.

Liu, H. & Hopcroft, R.R. (2006b) Growth and development of *Metridia pacifica* (Copepoda: Calanoida) in the northern Gulf of Alaska. *J. Plankton Res.*, **28**, 769-781.

Liu, H. & Hopcroft, R.R. (2007) A comparison of seasonal growth and development of the copepods *Calanus marshallae* and *C. pacificus* in the northern Gulf of Alaska. *J. Plankton Res.*, **29**, 569-581.

Liu, H. & Hopcroft, R.R. (2008) Growth and development of *Pseudocalanus* spp. in the northern Gulf of Alaska. *J. Plankton Res.* **30**, 923-935.

Lewis, E.R., & Wallace, D.W.R. (1995) Basic programs for the CO_2 system in seawater. Brookhaven National Laboratory, BNL-61827.

Napp, J.M., Hopcroft, R.R., Baier, C.T. & Clarke, C. (*2005*) Distribution and species-specific egg production of *Pseudocalanus* in the Gulf of Alaska. *J. Plankton Res.*, **27**, 415-426.

Parsons, T.R., Maita, Y. & Lalli, C.M. (1984). *A manual for chemical and biological methods in seawater*. Pergamon Press, Toronto. 173 pp.

Runge, J.A. & Roff, J.C. (2000) *The measurement of growth and reproductive rates*. pp. 401-454. *In:* Harris, R.P., Weibe, P.H., Lenz, J., Skjoldal, H.R. and Huntley, M. (ed.) ICES Zooplankton Methodology Manual, Academic Press, London.

Weingartner, T.J., Coyle, K.O., Finney, B., Hopcroft, R.R., Whitledge, T.E., Brodeur, R.D., Dagg, M., Farley, E., Haidvogel, D., Haldorson, L., Hermann, A., Hinckley, S., Napp, J.M., Stabeno, P., Kline, T., Lee, C., Lessard, E., Royer, T. & Strom, S. (2002) The Northeast Pacific GLOBEC program: coastal Gulf of Alaska. *Oceanography,* **15**, 48-63.

Whitledge, T.E., Malloy, S.C., Patton, C.J. & Wirick, C.D. (1981) Automated nutrient analyses in seawater. pp. 216, Brookhaven National Laboratory, Upton, New York.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$28.8	$35.3	$68.8	$71.8	$75.1	$279.7
Travel	$2.5	$2.6	$1.4	$1.5	$1.6	$9.5
Contractual	$49.0	$3.0	$1.5	$1.5	$1.5	$56.5
Commodities	$1.2	$3.0	$2.1	$1.5	$0.9	$8.7
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$8.6	$11.0	$18.4	$19.1	$19.8	$76.9
SUBTOTAL	$90.0	$54.9	$92.2	$95.4	$98.8	$431.4
General Administration (9% of subtotal)	$8.1	$4.9	$8.3	$8.6	$8.9	$38.8
PROJECT TOTAL	$98.1	$59.9	$100.5	$104.0	$107.7	$470.2
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In this box, identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

FY12-16

Program Title: Seward Line
Team Leader: R. Hopcroft

SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$28.8	$35.3	$68.8	$71.8	$75.1	$279.7
Travel	$2.5	$2.6	$1.4	$1.5	$1.6	$9.5
Contractual	$49.0	$3.0	$1.5	$1.5	$1.5	$56.5
Commodities	$1.2	$3.0	$2.1	$1.5	$0.9	$8.7
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$8.6	$11.0	$18.4	$19.1	$19.8	$76.9
SUBTOTAL	$90.0	$54.9	$92.2	$95.4	$98.8	$431.4
General Administration (9% of subtotal)	$8.1	$4.9	$8.3	$8.6	$8.9	$38.8
PROJECT TOTAL	$98.1	$59.9	$100.5	$104.0	$107.7	$470.2
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS:

FY12-16

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3A
NON-TRUSTEE AGENCY
SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft, R.	Principal Investigator	0.0			0.00
Mathis, J.	co-Investigator	0.5	11.20		5.60
Post doctoral fellow		1.0	5.90		5.90
Technician 1		1.0	8.27		8.27
Technician 2		1.0	9.04		9.04
		Subtotal	34.4	0.0	
				Personnel Total	$28.81

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (to cruise) - per diem only			32	0.03	0.96
Fairbanks to Seward (to cruise) - vehicle rental			2	0.75	1.50
				Travel Total	$2.5

FY12

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description		Contract Sum
shipping		1.0
CTD calibration		1.0
partial vessel lease		47.0
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$49.0

Commodities Costs: Description		Commodities Sum
project supplies		1.17
	Commodities Total	$1.17

FY12

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft, R.	Principal Investigator	0.0			0.00
Mathis, J.	co-Investigator	0.5	11.70		5.85
Post doctoral fellow	Investigator	4.8	6.13		29.42
Technician 1	zooplankton	0.0			0.00
Technician 2	zooplankton	0.0			0.00
		Subtotal	17.8	0.0	
				Personnel Total	$35.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (to cruise) - per diem only			32	0.03	0.96
Fairbanks to Seward (to cruise) - vehicle rental			2	0.83	1.66
				Travel Total	$2.6

FY13

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description		Contract Sum
shipping		2.0
CTD calibration		1.0
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$3.0

Commodities Costs: Description		Commodities Sum
project supplies		3.04
	Commodities Total	$3.04

FY13	**Program Title: Seward Line** **Team Leader: R. Hopcroft**	**FORM 3B** **CONTRACTUAL &** **COMMODITIES DETAIL**

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft, R.	Principal Investigator	0.5	13.01		6.51
Mathis, J.	co-Investigator	0.5	12.87		6.44
Post doctoral fellow	Investigator	3.0	6.41		19.23
Technician 1	zooplankton	1.0	9.03		9.03
Technician 2	zooplankton	2.0	9.88		19.76
Technician 3	chlorophyll	0.5	9.30		4.65
Technician 4	CTD	0.3	12.62		3.16
		Subtotal	73.1	0.0	
				Personnel Total	$68.77

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (to cruise) - per diem only			16	0.03	0.48
Fairbanks to Seward (to cruise) - vehicle rental			1	0.91	0.91
				Travel Total	$1.4

FY14

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
shipping	1.0
CTD calibration	0.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$1.5

Commodities Costs: Description	Commodities Sum
project supplies	2.1
Commodities Total	$2.1

FY14	Program Title: Seward Line Team Leader: R. Hopcroft	FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft, R.	Principal Investigator	0.5	13.60		6.80
Mathis, J.	co-Investigator	0.5	13.45		6.73
Post doctoral fellow	Investigator	3.0	6.69		20.07
Technician 1	zooplankton	1.0	9.44		9.44
Technician 2	zooplankton	2.0	10.32		20.64
Technician 3	chlorophyll	0.5	9.73		4.87
Technician 4	CTD	0.3	13.18		3.30
		Subtotal	76.4	0.0	
				Personnel Total	$71.84

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (to cruise) - per diem only			16	0.03	0.48
Fairbanks to Seward (to cruise) - vehicle rental			1	1.00	1.00
				Travel Total	$1.48

FY15

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description		Contract Sum
shipping		1.0
CTD calibration		0.5
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$1.5

Commodities Costs: Description		Commodities Sum
project supplies		1.5
	Commodities Total	$1.5

FY15

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15	**Program Title: Seward Line** **Team Leader: R. Hopcroft**	**FORM 3B** **EQUIPMENT DETAIL**

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft, R.	Principal Investigator	0.5	14.21		7.11
Mathis, J.	co-Investigator	0.5	14.05		7.03
Post doctoral fellow	Investigator	3.0	6.99		20.97
Technician 1	zooplankton	1.0	9.86		9.86
Technician 2	zooplankton	2.0	10.79		21.58
Technician 3	chlorophyll	0.5	10.16		5.08
Technician 4	CTD	0.3	13.78		3.45
		Subtotal	79.8	0.0	
				Personnel Total	$75.1

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (to cruise) - per diem only			16	0.03	0.48
Fairbanks to Seward (to cruise) - vehicle rental			1	1.10	1.10
				Travel Total	$1.58

FY16

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
PERSONNEL & TRAVEL
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description		Contract Sum
shipping		1.0
CTD calibration		0.5
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$1.5

Commodities Costs: Description		Commodities Sum
project supplies		0.9
	Commodities Total	$0.9

FY16	**Program Title: Seward Line** **Team Leader: R. Hopcroft**	**FORM 3B** **CONTRACTUAL &** **COMMODITIES DETAIL**

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16	**Program Title: Seward Line** **Team Leader: R. Hopcroft**	**FORM 3B** **EQUIPMENT DETAIL**

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term monitoring: Pelagic monitoring component **-** Continuing the Legacy: Prince William Sound Marine Bird Population Trends.

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s):): Dr. David B. Irons and Dr. Kathy Kuletz, Migratory Bird Management, U. S. Fish and Wildlife Service, david_irons@fws.gov, (907) 786-3376
Collaborators: Jim Bodkin, Brenda Ballachey, Tom Dean, John Piatt, Heather Coletti

Study Location: Prince William Sound

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al.

We propose to conduct small boat surveys to monitor abundance of marine birds in Prince William Sound, Alaska, during July 2012, 2014, and 2016. Eleven previous surveys have monitored population trends for marine birds and mammals in Prince William Sound after the *Exxon Valdez* oil spill. We will use data collected to examine trends from summer to determine whether populations in the oiled zone are increasing, decreasing, or stable. We will also examine overall population trends for the Sound. Continued monitoring of marine birds and synthesis of the data are needed to determine whether populations injured by the spill are recovering. Data collected from 1989 to 2010 indicated that pigeon guillemots (*Cepphus columba*) and marbled murrelets (*Brachyramphus marmoratus*)) are declining in the oiled areas of Prince William Sound. We have found high inter-annual variation in numbers of some bird species and therefore recommend continuing to conduct surveys every two years. These surveys are the only ongoing means to evaluate the recovery of most of these injured marine bird species. Surveys would also benefit the benthic monitoring and forage fish monitoring aspects of the Long-term Monitoring Project as well as the Herring Project.

Estimated Budget: $837,335.00
EVOSTC Funding Requested:
(breakdown by fiscal year and DOES NOT include 9% GA)

FY 12,	FY 13,	FY 14,	FY 15,	FY 16	TOTAL
$189,445.0	$22,200.0	$193,645.0	$22,200.0	$197,845.0	$625,335.0

Non EVOS Funds to be used:
(breakdown by fiscal year)

FY 12,	FY 13,	FY 14,	FY 15,	FY 16	TOTAL
$56,000.00	$22,000.0	$56,000.00	$22,000.0	$56,000.00	$212,000.0

Date: 23 MAY 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Identify the problem the project is designed to address. Describe the background and history of the problem. Include a scientific literature review that covers the most significant previous work history related to the project.

McKnight et al. (2008) examined whether marine bird and mammal species designated as injured by the *EVOS* Trustee Council had shown signs of recovery by 2007. Data collected from 1989 to 2007 in the oiled area indicated that common loons (*Gavia immer*) and cormorants (*Phalacrocorax spp.*) are increasing. Numbers of all other injured species are either not changing or are declining in the oiled area. Populations of harlequin ducks (*Histrionicus histrionicus*), black oystercatchers (*Haematopus bachmani*), Kittlitz's murrelets (*Brachyramphus brevirostris*), and common murres *(Uria aalgae*) are showing no trend in the oiled area; pigeon guillemots (*Cepphus columba*), and marbled murrelets (*Brachyramphus marmoratus*), are declining in the oiled areas of Prince William Sound in summer. Pigeon Guillemots are the only bird on the EVOSTC injured species list that is "not recovering". In addition Kittlitz's murrelet is a candidate species under the Endangered Species Act and PWS is one of the few remaining hotspots for it. There are no other surveys done in PWS to get population estimates for marine birds.

Using small boat surveys, this project will collect additional information to monitor the distribution and abundance of marine birds and sea otters in Prince William Sound. These data will be combined with data collected in 1989-91 (Klosiewski and Laing 1994), 1993 (Agler et al. 1994a), 1994 (Agler et al. 1995a), 1996 (Agler and Kendall 1997), 1998 (Lance et al. 1999, Irons et al. 2000, Lance et al. 2001) and 2000 (Stephensen et al. 2001), 2004 (Sullivan et al.2005), 2005 (McKnight et al. 2006), and 2007 (McKnight et al. 2008) to examine trends in marine bird distribution and abundance. This project will benefit restoration of Prince William Sound by determining whether populations that declined due to the spill are recovering and by identifying which species are still of concern.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

List the objectives of the proposed research, the hypotheses being tested during the project, and briefly state why the intended research is important.

To determine population abundance, with 95% confidence limits, of marine bird populations in Prince William Sound during March and July 2012, 2014 and 2016 in both oiled and unoiled regions, as well as in Prince William Sound as a whole, in order to assess population trends in the years following the EVOS.

B. Procedural and Scientific Methods

For each objective listed in A. above, identify the specific methods that will be used to meet the objective. In describing the methodologies for collection and analysis, identify measurements to be made and the anticipated precision and accuracy of each measurement and describe the sampling equipment in a manner that permits an assessment of the anticipated raw-data quality.

If applicable, discuss alternative methodologies considered, and explain why the proposed methods were chosen. In addition, projects that will involve the lethal collection of birds or mammals must comply with the Trustee Council's policy on collections, available at www.evostc.state.ak.us/Proposals/policies.htm.

Survey methodology and design will remain identical to that of past marine bird surveys conducted by the U. S. Fish and Wildlife Service in 1989, 1990, 1991, (Klosiewski and Laing 1994), 1993 (Agler et al. 1994a), 1994 (Agler et al. 1995a), 1996 (Agler and Kendall 1997), 1998 (Lance et al. 1999), 2000 (Stephensen et al. 2001), 2004 (Sullivan et al. 2005), 2005 (McKnight et al. 2006), and 2007 (McKnight et al. 2008). We will conduct three surveys: one during during July ("summer") 2012, 2014, and 2016. We will use three 7.7 m fiberglass boats traveling at speeds of 10-20 km/hr to survey transects over a 3-week period.

We will continue to use a stratified random sampling design containing three strata: shoreline, coastal-pelagic, and pelagic (Klosiewski and Laing 1994) (Fig. 1). The shoreline stratum will consist of waters within 200 m of land. Irons et al. (1988b) divided this stratum, by habitat, into 742 transects with a total area of 820.74 km^2. We will locate shoreline transects by geographic features, such as points of land, to facilitate orientation in the field and to separate the shoreline by habitat (Irons et al. 1988a,b). Shoreline transects will vary in size, ranging from small islands with <1 km of coastline to sections of the mainland with over 30 km of coastline. Mean transect length will be 5.55 km. During summer, we plan to survey 212 shoreline transects. All transects were randomly chosen, and the same transects are used each survey (Klosiewski and Laing 1994).

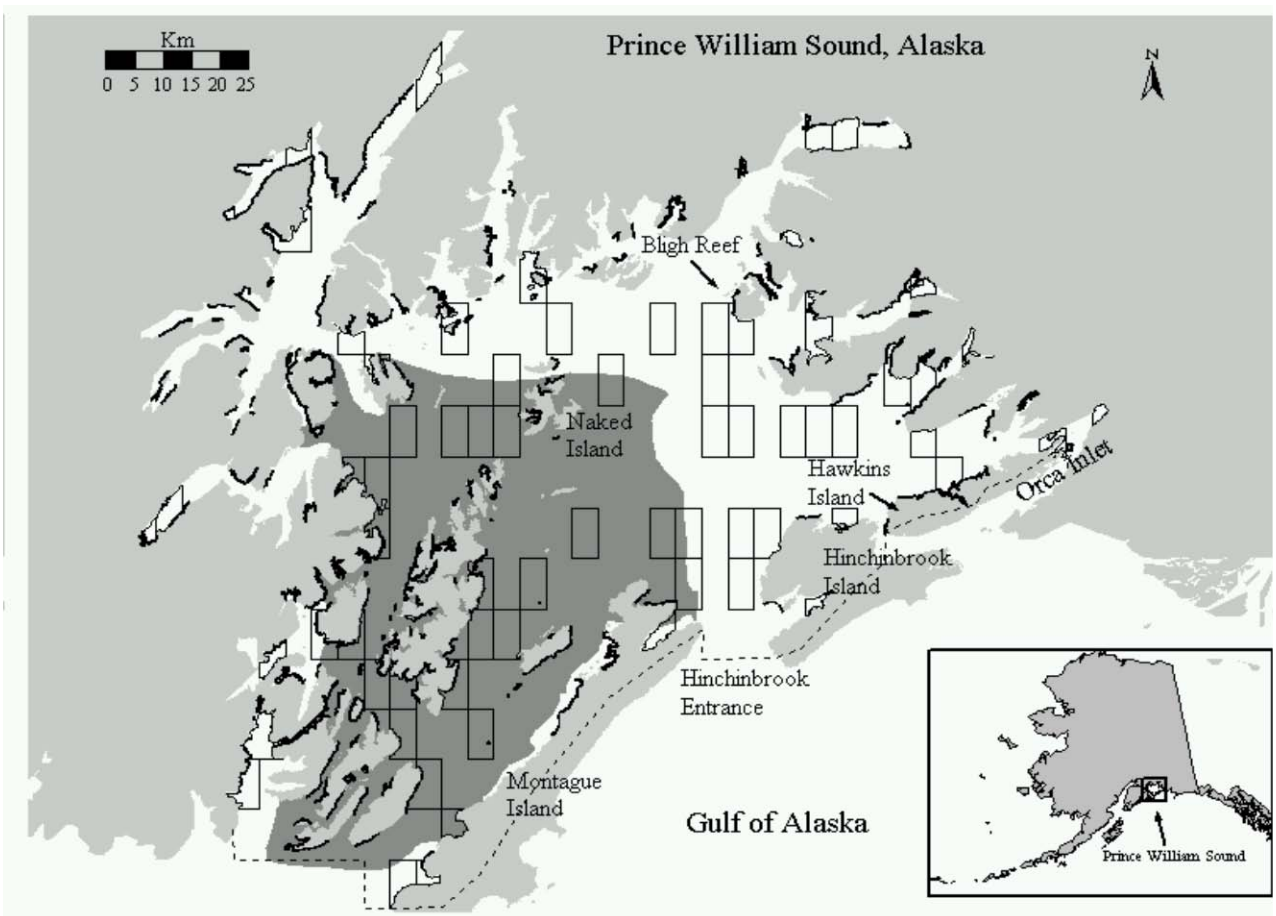


Figure 1. Locations of shoreline transects and pelagic transect blocks in Prince William Sound. Shading denotes the oiled region.

Justification:

Almost 30,000 marine bird (Piatt et al. 1990) and 900 sea otter (DeGange and Lensink 1990) carcasses were recovered following the *Exxon Valdez* oil spill. Based on modeling studies using carcass search effort and population data, an estimated 250,000 marine birds were killed in Prince William Sound and the northern Gulf of Alaska (Piatt and Ford 1996). Garrott et al. (1993) estimated that 2,800 sea otters also were killed. These estimates are probably low, because they only include direct mortality occurring in the first five months after the spill.

Twenty two years after the EVOS there are populations of Pigeon Guillemots, Kittlitz's Murrelets, and Marbled Murrelets are down by 50% to 90% compared to population numbers in 1989 after the initial mortality. All these species were affected by the spill, but are likely no longer being affected, however populations have never recovered. All three species rely on Pacific Herring during the summer breeding season and may be impacted by the herring crash of 1993.

There are no other studies monitoring population trends of these or any other marine bird species in PWS.

Linkages:
Pigeon Guillemots, Kittlitz's Murrelets, and Marbled Murrelets have continued to decline after the spill. All three species rely on Pacific Herring during the summer breeding season and may be impacted by the herring crash of 1993.

The EVOSTC has funded 11 surveys in 22 years to following population trends of marine birds in Prince William Sound. This is the best at-sea data set for marine bird populations in Alaska. This data set has been used to track recovery or lack of recovery for several injured species. It also provides the only information on the population trend of Kittlitz's murrelet, an ESA candidate species.

This component will provide the data on marine bird and mammal populations for the Benthic Nearshore Project.

Sea otters are counted on these surveys as well as marine birds.

Major Logistics:
A charter vessel 7 days in July that sleeps nine.

During July three 25' Fiberglass boats will be used.

C. Data Analysis and Statistical Methods

As in previous surveys (Klosiewski and Laing 1994, Agler et al. 1994a,b,c, 1995a,b, Agler and Kendall 1997, Lance et al. 1999, Stephensen et al. 2001, Sullivan et al. 2005, McKnight et al. 2006, McKnight et al. 2008), we will use a ratio estimator (Cochran 1977) to estimate population abundance. Shoreline transects will be treated as a simple random sample; whereas the coastal-pelagic and pelagic transects will be analyzed as two-stage cluster samples of unequal size (Cochran 1977). To do this, we will estimate the density of birds counted on the combined transects for a block and multiply by the area of the sampled block to obtain a population estimate for each block; any land or shoreline area (within 200m of land) intersecting a block will be subtracted from the total area of that block. We then will add the estimates from all blocks surveyed and divide by the sum of the areas of all blocks surveyed. We will calculate the population estimate for a stratum by multiplying this estimate by the area of all blocks in the strata. Population estimates for each species and for all birds in Prince William Sound will be calculated by adding the estimates from the three strata, and we will calculate 95% confidence intervals for these estimates from the sum of the variances of each stratum (Klosiewski and Laing 1994).

a) Trends in the oiled region

We will perform a linear regression on log-tranformed population estimates over time (1989 – 2016) in the oiled region of Prince William Sound. Prior to calculating the $\log_{10}$ of each population estimate, we will add a constant of 0.167 to each estimate to avoid the undefined $\log_{10}$ of 0. In all analyses we will use a test size alpha = 0.10 to balance Type I and Type II errors. The reasons for this include: 1) variation is often high and sample sizes low (n = 11 survey years); and 2) monitoring studies are inherently different from experiments and the number of tests being run with a multi-species survey are many, therefore, controlling for the number of tests by lowering alpha levels (e.g. Bonferroni adjustment) might obscure trends of biological value.

Taxa with significant increasing trends in the oiled region will be considered “recovering,” while taxa with no trends or significant negative trends will be considered “not recovering.

b) Comparing trends between oiled and unoiled regions

We will use the regression technique detailed in (a) to perform regression analyses on population estimates (1989 – 2016) in the unoiled region. We will use a homogeneity of slopes test (Freud and Littell 1981) to compare population trends between the oiled and unoiled zones of Prince William Sound to examine whether species with population estimates of >500 individuals have changed over time. To do this, we must assume that marine bird and sea otter populations increase at the same rate in the oiled and unoiled zones of Prince William Sound. Significantly different slopes would indicate that population abundance of a species or species group changed at different rates.

Taxa showing no difference in trends between the oiled and unoiled regions will be considered “not recovering.” Taxa showing significantly greater trends in the oiled region compared with the unoiled region will be considered “recovering.” Taxa showing significantly greater trends in the unoiled region compared to the oiled region will be considered to be suffering "continuing and increasing effects."

Overall, a species will be considered "recovering" if it meets the requirements for this category in either the regression analysis within the oiled region or the homogeneous slopes analysis.

To determine optimum survey frequency, we conducted a power analysis to estimate the probability of detecting trends in abundance using linear regression from a given number of samples (Taylor and Gerrodette 1993). We examined our power to detect trends when coefficient of variation (CV) of the population was 0.30 (greater than the mean CV from previous surveys for 73% of the injured species; Fig. 2) and when the CV = 0.13 (the mean summer CV for *Brachyramphus* murrelets, an injured species. Models of seabird population growth predict most species increase no more than 12% per year (Nur and Ainley 1992), so we used 10% for our comparisons. With CV=0.30 the probability of detecting an average annual change of 10% would be 92% with the 10 surveys completed to date (Fig. 2).

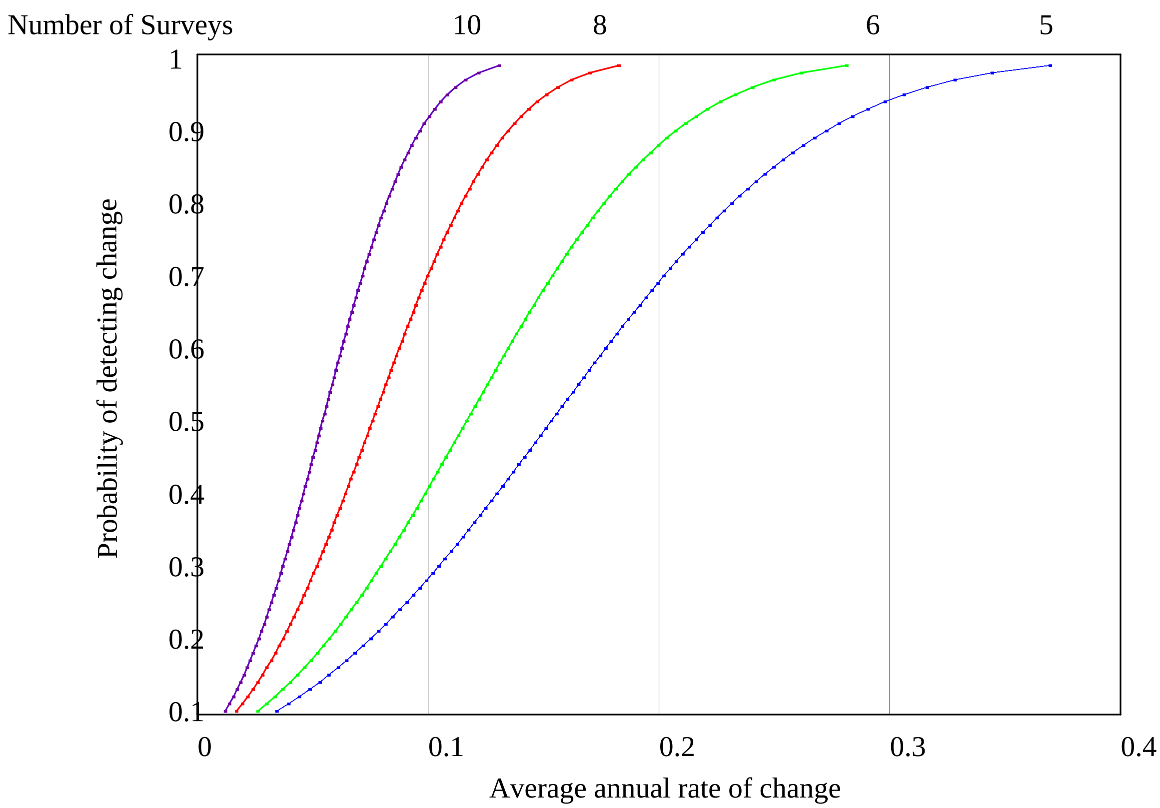


Figure 2. Estimated power based on numbers of surveys (5, 6, 8, and 10) conducted to detect a trend in marine bird populations in Prince William Sound when the CV = 0.30.

D. Description of Study Area

Our study area includes all waters within Prince William Sound and all land within 100 m of shore (Fig. 1). We exclude Orca Inlet, near Cordova, Alaska and the southern sides of Montague, Hinchinbrook, and Hawkins Islands (Klosiewski and Laing 1994).

E. Coordination and Collaboration with Other Efforts

Indicate how your proposed project relates to, complements or includes collaborative efforts with other proposed or existing projects funded by the Trustee Council. Describe any coordination that has taken or will take place (with other Council funded projects, ongoing agency operations, activities funded by other marine research entities, etc.) and what form the coordination will take (shared field sites, research platforms, sample collection, data management, equipment purchases, etc.). If the proposed project requires or includes collaboration with other agencies, organizations or scientists to accomplish the work, such arrangements should be fully explained and the names of agency or organization representatives involved in the project should be provided. If your proposal is in conflict with another project, note this and explain why.

III. SCHEDULE

A. Project Milestones

For each project objective listed above (II.A.), specify when critical project tasks will be completed. Project reviewers will use this information in conjunction with annual project reports to assess whether projects are meeting their objectives and are suitable for continued funding. Please format your information like the following example.

Objective 1. To determine population abundance, with 95% confidence limits, of marine bird populations in Prince William Sound during July 2012, 2014 and 2016 in both oiled and unoiled regions, as well as in Prince William Sound as a whole, in order to assess population trends in the years following the EVOS.
To be met by April 2013, 2015, and 2017

B. Measurable Project Tasks

Specify, by each quarter of each fiscal year, when critical project tasks (for example, sample collection, data analysis, manuscript submittal, etc.) will be completed. This information will be the basis for the quarterly project progress reports that are submitted to the Trustee Council Office. Please format your schedule like the following example.

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)
Project funding approved by Trustee Council
Attend Annual PI Meeting

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)
Hire project personnel

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)
Prepare for Field Season

FFY 12, 4th quarter (July 1, 2012-September 30, 2012)
Conduct field work
Submit annual report

FFY 13, 1st quarter (October 1, 2012-December 31, 2012)
Analyze data
Attend Annual PI Meeting

FFY 13, 2nd quarter (January 1, 2013-March 31, 2013)
Attend Alaska Marine Science Symposium

FFY 13, 3rd quarter (April 1, 2013-June 30, 2013)

FFY 13, 4th quarter (July 1, 2013-September 30, 2013)
Submit annual report

FFY 14, 1st quarter (October 1, 2013-December 31, 2013)
Attend Annual PI Meeting

FFY 14, 2nd quarter (January 1, 2014-March 31, 2014)
Attend Alaska Marine Science Symposium
Hire project personnel

FFY 14, 3rd quarter (April 1, 2014-June 30, 2014)
Prepare for Field Season

FFY 14, 4th quarter (July 1, 2014-September 30, 2014)
Conduct field work
Submit annual report

FFY 15, 1st quarter (October 1, 2014-December 31, 2014)
Attend Annual PI Meeting

FFY 15, 2nd quarter (January 1, 2015-March 31, 2015)
Attend Alaska Marine Science Symposium

FFY 15, 3rd quarter (April 1, 2015-June 30, 2015)

FFY 15, 4th quarter (July 1, 2015-September 30, 2015)
Submit annual report

FFY 16, 1st quarter (October 1, 2015-December 31, 2015)
Attend Annual PI Meeting

FFY 16, 2nd quarter (January 1, 2016-March 31, 2016)
Attend Alaska Marine Science Symposium
Hire project personnel

FFY 16, 3rd quarter (April 1, 2016-June 30, 2016)
Prepare for Field Season

FFY 16, 4th quarter (July 1, 2016-September 30, 2016)
Conduct field work
Submit annual report

LITERATURE CITED

Agler, B. A., P. E. Seiser, S. J. Kendall, and D. B. Irons. 1994a. Marine bird and sea otter populations of Prince William Sound, Alaska: population trends following the *T/V Exxon Valdez* oil spill. Restoration Project No. 93045. Final Rep., U. S. Fish and Wildl. Serv., Anchorage, Alas. 51 pp. + appendices.

Agler, B. A., S. J. Kendall, P. E. Seiser, and D. B. Irons. 1994b. Population estimates of marine bird and sea otter populations in Lower Cook Inlet, Alaska during June 1993. Unpubl. Rep., U. S. Fish and Wildl. Serv., Anchorage, Alas. 73 pp. + appendices.

Agler, B. A., S. J. Kendall, P. E. Seiser, and D. B. Irons. 1994c. Field report: marine bird survey of Lower Cook Inlet, February-March 1994. Unpubl. Rep., U. S. Fish and Wildlife Service, Anchorage, Alas. 17 pp.

Agler, B. A., S. J. Kendall, P. E. Seiser, and D. B. Irons. 1995a. Winter marine bird and sea otter abundance of Prince William Sound, Alaska: trends following the *T/V Exxon Valdez* oil spill from 1990-94. Final Rep., U. S. Fish and Wildlife Service, Anchorage, Alas. 68 pp. + appendices.

Agler, B. A., S. J. Kendall, P. E. Seiser, and J. R. Lindell. 1995b. Estimates of marine bird and sea otter abundance in Southeast Alaska during summer 1994. Draft Rep., U. S. Fish and Wildl. Serv., Anchorage, Alas. 87 pp. + appendices.

Agler, B. A., and S. J. Kendall. 1997. Marine Bird and Mammal Population Abundance of Prince William Sound, Alaska: Trends following the *T/V Exxon Valdez* Oil Spill, 1989-96. Restoration Project No. 96159. Final Rep., U.S. Fish and Wildl. Serv., Anchorage, Alas.

Burn, D. M. 1994. Boat-based population surveys of sea otters (*Enhydra lutris*) in Prince William Sound, in response to the *Exxon Valdez* oil spill. NRDA Marine Mammal Study Number 6. U. S. Fish and Wildl. Serv., Anchorage, Alas.

Cochran, W. G. 1977. Sampling techniques. John Wiley and Sons, Inc., New York 428 pp.

DeGange, A. R., and C. J. Lensink. 1990. Distribution, age, and sex composition of sea otter carcasses recovered during the response to the T/V *Exxon Valdez* oil spill. Pages 124-129 in K. Bayha and J. Kormendy, eds. Sea otter symposium: proceedings of a symposium to evaluate the response effort on behalf of sea otters after the T/V *Exxon Valdez* oil spill into Prince William Sound, Anchorage, Alaska, 17-19 April 1990. U. S. Fish and Wildl. Serv., Biol. Rep. 90(12). 485 pp.

Dwyer, T. J., P. Isleib, D. A. Davenport, and J. L. Haddock. 1976. Marine Bird Populations in Prince William Sound Alaska. Unpubl. Rep., U. S. Fish and Wildl. Serv., Anchorage, Alas. 24 pp.

Ecological Consulting, Inc. 1991. Assessment of direct mortality in Prince William Sound and the western Gulf of Alaska resulting from the *Exxon Valdez* oil spill. Unpubl. Rep., Ecological Consulting, Inc., Portland, Oreg. 153 pp.

Exxon Valdez Oil Spill Trustee Council. 1994. *Exxon Valdez* oil spill restoration plan. *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alas. 56 pp. + appendices.

Freud, R. J., and R. C. Littell. 1981. SAS for linear models: a guide to the ANOVA and GLM procedures. SAS Institute Inc., Cary, N. C. 231 pp.

Garrott, R. A., L. L. Eberhardt, and D. M. Burn. 1993. Mortality of sea otters in Prince William Sound following the *Exxon Valdez* oil spill. Mar. Mamm. Sci. 9(4):343-59.

Hogan, M. E., and J. Murk. 1982. Seasonal distribution of marine birds in Prince William Sound, based on aerial surveys, 1971. Unpubl. Rep., U. S. Fish and Wildl. Serv., Anchorage, Alas. 22 pp. + appendices.

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.

Irons, D. B., D. R. Nysewander, and J. L. Trapp. 1988a. Prince William Sound sea otter distribution in relation to population growth and habitat type. Unpubl. Rep., U. S. Fish and Wildl. Serv., Anchorage, Alas. 31 pp.

Irons, D. B., D. R. Nysewander, and J. L. Trapp. 1988b. Prince William Sound waterbird distributions in relation to habitat type. Unpubl. Rep., U. S. Fish Wildl. Serv., Anchorage, Alas. 26 pp.

Isleib, P. and B. Kessel. 1973. Birds of the North Gulf Coast - Prince William Sound Region, Alaska. Biol. Pap. Univ. Alaska 14. 149 pp.

Klosiewski, S. P., and K. K. Laing. 1994. Marine bird populations of Prince William Sound, Alaska, before and after the *Exxon Valdez* oil spill. Exxon Valdez Oil Spill State and Federal Natural Resources Damage Assessment Final Reports, U. S. Fish and Wildl. Serv., Anchorage, Alas. 89 pp.

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.

Lance, B. K., D. B. Irons, S. J. Kendall, and L. L. McDonald. 1999. Marine Bird Population Abundance of Prince William Sound, Alaska: Trends following the *Exxon Valdez* oil spill. Restoration Project No. 98159. Final Rep., U.S. Fish and Wildl. Serv., Anchorage, Alas.

McKnight, A. E., K. M. Sullivan D. B. Irons, S. W. Stephensen and S. Howlin. 2006. Marine Bird and Sea Otter Population Abundance of Prince William Sound, Alaska: Trends following the *Exxon Valdez* oil spill 1989-2005. Restoration Project No. 050751. Annual Rep., U.S. Fish and Wildl. Serv., Anchorage, Alas.

McKnight, A. E., K. M. Sullivan D. B. Irons, S. W. Stephensen and S. Howlin. 2008. Marine Bird and Sea Otter Population Abundance of Prince William Sound, Alaska: Trends following the *Exxon Valdez* oil spill 1989-2007. Restoration Project No. 070751. Annual Rep., U.S. Fish and Wildl. Serv., Anchorage, Alas.

Nur, N. and D. G. Ainley. 1992. Comprehensive review and critical synthesis of the literature on recovery of marine bird populations from environmental perturbations. Final Rep., *Exxon Valdez* Restoration and Planning Work Group.

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

Piatt, J. F. and R. G. Ford. 1996. How many birds were killed by the *Exxon Valdez* oil spill? Pages 712-719 in S. D. Rice, R. B. Spies, D. A. Wolfe, and B. A. Wright, eds. Proceedings of the *Exxon Valdez* oil spill symposium. American Fisheries Society Symposium 18. 931 pp.

Sauer, J. R., and P. H. Geissler. 1990. Estimation of annual indices from roadside surveys. Pages 58-62 in J. R. Sauer and S. Droege, eds. Survey designs and statistical methods for the estimation of avian population trends. U. S. Fish and Wildl. Serv., Biol. Rep. 90(1). 166 pp.

Stephensen, S. W., D. B. Irons, S. J. Kendall, B. K. Lance, and L. L. McDonald. 2001. Marine Bird Population Abundance of Prince William Sound, Alaska: Trends following the *Exxon Valdez* oil spill. Restoration Project No. 00159. Final Rep., U.S. Fish and Wildl. Serv., Anchorage, Alas.

Sullivan, K. M., A. E. McKnight, D. B. Irons, S. W. Stephensen and S. Howlin. 2005. Marine Bird and Sea Otter Population Abundance of Prince William Sound, Alaska: Trends following the *Exxon Valdez* oil spill 1989-2004. Restoration Project No. 04159. Annual Rep., U.S. Fish and Wildl. Serv., Anchorage, Alas.

Taylor, B. L., and T. Gerrodette. 1993. The use of statistical power in conservation biology: the vaquita and northern spotted owl. Cons. Biol. 7(3):489-500.

CURRICULUM VITAE OF PROPOSED PRINCIPAL INVESTIGATORS

Dr. David B. Irons
U.S. Fish and Wildlife Service
1011 East Tudor Road
Anchorage, Alaska 99503
david_irons@fws.gov
(907) 786-3376

EDUCATION

B. S. Environmental Resource Management 1976	*Pennsylvania State University*
M. S. Wildlife Ecology 1982	*Oregon State University*
Ph. D. Biology 1992	*University of California, Irvine*

RECENT PROFESSIONAL EXPERIENCE

1999-2011	Alaska Seabird Coordinator, Migratory Bird Management, U.S. Fish and Wildlife Service
1993-1998	Marine Bird Monitoring Coordinator, Migratory Bird Management, U.S. Fish and Wildlife Service
1984-1992	Biologist, Migratory Bird Management, U.S. Fish and Wildlife Service

COMMITTEES

Chair, World Seabird Conference, International Steering Committee
Alaska Region Representative, North American Colonial Waterbird Conservation Plan
Chair, Alaska Seabird Working Group
Chair, Circumpolar Seabird Group
Seabird Coordinator, Circumpolar Arctic Flora and Fauna (CAFF), Circumpolar Biodiversity Monitoring Network.
Chair, Pacific Seabird Group – 2003-2005

Related Publications

Golet, G. H., J. A. Schmutz, D. B. Irons, and J. A. Estes. 2004. Mechanistic determinants of reproductive costs in a long-lived seabird: a multiyear experimental study of the black-legged kittiwake. *Ecological Monographs* 74:353-372.

Peterson, C.H., S.D. Rice, J.W. Short, D. Esler, J.L. Bodkin, B.E. Ballachey, D.B. Irons. 2003. Long-term ecosystem response to the Exxon Valdez oil spill. *Science* 302:2082-2086.

Ainley, D.G., R. G. Ford, E. D. Brown, R. M. Suryan, and D. B. Irons. 2003. Prey resources, competition, and geographic structure of kittiwake colonies in Prince William Sound, Alaska. *Ecology* 84: 709-723.

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* 42:298-309.

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.

Other Publications

Irons, D.B., T. Anker-Nilssen, A. J. Gaston, G. V. Byrd, K. Falk, G. Gilchrist, M. Hario, M. Hjernquist, Y. V. Krasnov, A. Mosbech, B. Olsen, A. Petersen, J. B. Reid, G. J. Robertson, H. Strøm, & K. D. Wohl. 2008. Fluctuations in circumpolar seabird populations linked to climate oscillations. *Global Change Biology* 14:145-1463.

Golet, G. H., and D. B. Irons. 1999. Raising young reduces body condition and fat stores in Black-legged Kittiwakes. *Oecologia* 120:530-538.

Irons, D. B. 1998. Foraging area fidelity of individual seabirds in relation to tidal cycles and flock feeding. *Ecology* 70:647-655.

Golet, G. H., D. B. Irons, and J. A. Estes. 1998. Survival costs of chick rearing in Black-legged Kittiwakes. *Journal of Animal Ecology* 67:827-841.

Irons, D. B., R. G. Anthony, and J. A. Estes. 1986. Foraging strategies of glaucous-winged gulls in a rocky intertidal community. *Ecology* 67:1460-74.

COLLABORATORS

Ainley, David, H.T. Harvey and Associates
Anker-Nilssen, Tycho, NINA, Norway
Brown, Evelyn, UAF
Byrd, Vernon, USFWS
Decker, Mary Beth, Yale U
Drew, Gary, USGS
Dragoo, Don, USFWS
Erickson, Wally, West Inc.
Ford, Glenn, R.G. Ford Consulting
Golet, Greg, TNC
Jodice, Pat, Clemson U.
Kendall, Steve, USFWS
Kuletz, Kathy, USFWS
Lance, Brian, NMFS
McDonald, Lyman, West Inc.
Ostrand, Bill, USFWS
Piatt, John, USGS
Roby, Dan, OSU
Schmutz, Joel USGS
Stephensen, Shawn, USFWS
Suryan, Rob, OSU
Turco, Kathy, self employed

Dr. Kathy J. Kuletz
U.S. Fish and Wildlife Service
1011 East Tudor Road
Anchorage, Alaska 99503
Phone : 907-786-3453 Email: Kathy_Kuletz@fws.gov

Academic Training

Ph.D. Biology, 2005	Univ. of Victoria, British Columbia
M. S. Ecology & Evolutionary Biology, 1983	University of California, Irvine
B. S. Wildlife Ecology, 1974	California State Polytechnic, San Luis Obispo, with Honors

Recent Professional Experience

2005-present Pelagic Observer Program Coordinator, Migratory Bird Management, USFWS
1998-2005 Alaska Seabird Specialist, Migratory Bird Management, USFWS
1989-1997 Principal Investigator, *Exxon Valdez* studies on marine birds, USFWS

Related Professional Experience

PI for Seabirds in Bering Sea Integrated Research Program (BSIERP), with NPRB grant
PI for North Pacific Pelagic Seabird Observer Program, with NPRB grant
Co-PI for 'Seabirds as Predators on Juvenile Herring', funded by EVOS in 2006-2009.
PI and Co-PI for EVOS projects on murrelets and pigeon guillemots, 1989 - 1999
PI for project on decadal changes in seabirds in Kachemak Bay (ADFG/SWG grant), 2004-2007.

Committees

Science & Statistical Committee of North Pacific Fisheries Management Council (2007-present)
NOAA/NPFMC Groundfish Fisheries Plan Team (2000 – 2006)
North Pacific Albatross Working Group
EVOS Prince William Sound Herring Working Group
Marbled Murrelet Technical Committee, Kittlitz's Murrelet Technical Committee (PSG)

Professional Societies

Pacific Seabird Group (Secretary, 1998-1999)
American Ornithologists' Union
Society of Conservation Biologists
The Wildlife Society

Honors, Awards, and Fellowships

Exceptional Service Award, *Exxon Valdez* Oil Spill, U.S. Fish and Wildlife Service, 1989
Regents Fellowship, University of California, Irvine, 1980, 1981
King Platt Memorial Award, University of Victoria, 1998 & 1999

Related Publications

Golet, G. H., K. J. Kuletz, D. D. Roby, and D. B. Irons. 2000. Adult prey choice affects chick growth and reproductive success in pigeon guillemots. Auk 117(1):82-91.

Kuletz, K.J., D. Irons, J.F. Piatt, B. Agler, and D.C. Duffy. 1997. Long-term changes in diets and populations of piscivorous birds and mammals in Prince William Sound, Alaska. Pages 703-706 *In:* B.R. Baxter (ed.), Proceedings of the Symposium on the Role of Forage Fish in the Marine Ecosystem. Alaska Sea Grant College Program AK-SG-97-01.

Kuletz, K. J., and S. J. Kendall. 1998. A productivity index for marbled murrelets in Alaska based on surveys at sea. Journal of Wildlife Management 62(2):446-460.

Kuletz, K.J., E. A. Labunski, M. Renner, D.B. Irons. The North Pacific Pelagic Seabird Observer Program. North Pacific Research Board Final Report, Project No. 637.

Kuletz, K. J., S.W. Stephensen, D.B. Irons, E.A. Labunski, & K.M. Brenneman. 2003. Changes in distribution and abundance of Kittlitz's murrelets *Brachyramphus brevirostris* relative to glacial recession in Prince William Sound, Alaska. Marine Ornithology 31:133-140.

Other Publications

Golet, G. H., P. E. Seiser, A. D. McGuire, D. D. Roby, J. B. Fischer, K. J. Kuletz, D. B. Irons, T. A. Dean, S. C. Jewett, and S. H. Newman. 2002. Long-term direct and indirect effects of the '*Exxon Valdez*' oil spill on pigeon guillemots in Prince William Sound, Alaska. Marine Ecology Progress Series. Vol 241: 287-304.

Kuletz, K. J. 1996. Marbled murrelet abundance and breeding activity at Naked Island, Prince William Sound, and Kachemak Bay, Alaska, before and after the *Exxon Valdez* oil spill. Pages 770-784 *in* S. D. Rice, R. B. Spies, D. A. Wolfe, and B. A. Wright, editors. Proceedings of the *Exxon Valdez* oil spill symposium. American Fisheries Society Symposium 18.

Kuletz, K.J. 2005. Foraging behaviour and productivity of a non-colonial seabird, the Marbled Murrelet (*Brachyramphus marmoratus*) relative to prey and habitat. Ph.D. Dissertation. University of Victoria, Victoria, British Columbia.

Kuletz, K.J. E.A. Labunski, S.G. Speckman. 2008. Abundance, distribution, and decadal trends of Kittlitz's and marbled murrelets and other marine species in Kachemak Bay, Alaska. Final Report (Project No. 14) by U.S. Fish and Wildlife Service for Alaska Dept. Of Fish and Game, State Nongame Wildlife Grant, Anchorage, Alaska.

Piatt, J.F., Kuletz, K.J., Burger, A.E., Hatch, S.A., Friesen, V.L., Birt, T.P., Arimitsu, M.L., Drew, G.S., Harding, A.M.A., Bixler, K.S. 2007. Status review of the marbled murrelet (*Brachyramphus marmoratus*) in Alaska and British Columbia. Open-file report, 2006-1387. Alaska Science Center, U.S.G.S., Anchorage, Alaska. 258p.

Recent Collaborators

Mary Anne Bishop (Prince William Sound Science Center); Vernon Byrd (U.S. Fish and Wildlife Service); George L. Hunt, Jr. (University of Washington); David Irons (U.S. Fish and Wildlife Service); Alexander Kataysky (Univ. of Alaska, Fairbanks); John Piatt (U.S. Geological Survey, Alaska Science Center); Dan Roby (Oregon State University); Mike Sigler (Alaska Fisheries Science Center, NOAA); Andrew Trites (University of British Columbia).

Budget Justification

FY 2012 – $189,445.00
FY 2013 -- $22,200.00
FY 2014 – $193,645.00
FY 2015 – $22,200.00
FY 2016 -- $197,845.00

TOTAL: $625,335.00

Project Title: <u>Long-term monitoring: Pelagic monitoring component</u> - Continuing the Legacy: Prince William Sound Marine Bird Population Trends.

Personnel: A project leader (GS 11) is needed to run the project and must possess supervisory skills to govern the activities of eight subordinate workers. A minimum of three persons per boat (3 boats) for a total of nine persons are needed to conduct the survey. We will need a supervisory biological technicians for five months to assist in field preparation and equipment maintenance, we will need three other biological technicians and four volunteers (due to lack of funding) -- approximately 20 days of survey time plus 25 days for field gear preparation/maintenance and training. The project leader will allocate 8 months to the project during years with a survey and 3 months during the off years. The project leaser will be responsible for conducting QA/QC on the data, entering data into the North Pacific Pelagic Seabird Database, conducting analysis, writing reports and meeting attendance.
Request: (FY 2012: $99.9K; FY 2013: $22.2K, FY 2014: $99.9K; FY 2015: $22.2K: FY 2016: $99.9 TOTAL: $344.3K)

Travel: Nine people will be traveling throughout Prince William Sound and will need approximately 15 nights of lodging the Sound (and additional 7 will be aboard the charter vessel). Per diem will be given to each person during each survey. A tunnel fee is assessed to every vehicle traveling through the tunnel near Portage and the truck/boat will make 8 round trips during each survey.
Request: (FY 2012: $11.8K; FY 2013: $0.0K, FY 2014: $11.8K; FY 2015: $0.0K: FY 2016: $11.8 TOTAL: $35.5K)

Contractual: Prince William Sound is large and requires extensive travel by boat. To make the survey cost effective, a support vessel will be contracted to provide lodging and food for 7 survey days. The boats will operate for hundreds of hours and will need repairs and replacement parts. There are also fees associated with launching and parking the boat in the harbors.
Request: (FY 2012: $37.1K; FY 2013: $0.0K, FY 2014: $37.1K; FY 2015: $0.0K: FY 2016: $37.1K TOTAL: $111.3K)

Commodities: Includes gas and oil to support boat transport and operation during the surveys; food for 9 people while on survey; and personal safety devices.
.

Request: (FY 2012: $34.6K; FY 2013: $0.0K, FY 2014: $38.8K; FY 2015: $0.0K: FY 2016: $43.0 TOTAL: $116.3K)

Equipment: We are using USFWS equipment for this survey as an in-kind contribution but the survey work takes a toll on boats; on average, each boat will run a total of 20 full days per survey. As a result, we are including funds for emergency replacement of motor parts that fail during the survey should that need arise.

Request: (FY 2012: $6.0K; FY 2013: $0.0K, FY 2014: $6/0K; FY 2015: $0.0K: FY 2016: $6.0 TOTAL: $18.0K)

Indirect: We are using the standard G&A rate of 9%.

Request: Will not be included in the budget amount requested here.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$100.0	$22.2	$100.0	$22.2	$100.0	$344.3
Travel	$11.6	$0.0	$11.8	$0.0	$11.8	$35.3
Contractual	$37.1	$0.0	$37.1	$0.0	$37.1	$111.3
Commodities	$34.6	$0.0	$38.8	$0.0	$43.0	$116.3
Equipment	$6.0	$0.0	$6.0	$0.0	$6.0	$18.0
Indirect Costs (*will vary by proposer*)						
SUBTOTAL	$189.3	$22.2	$193.6	$22.2	$197.8	$625.2
General Administration (9% of subtotal)	$17.0	$2.0	$17.4	$2.0	$17.8	$56.3
PROJECT TOTAL	$206.3	$24.2	$211.1	$24.2	$215.7	$681.4
Other Resources (Cost Share Funds)	$56.0	$22.0	$56.0	$22.0	$56.0	$212.0

COMMENTS: Cost share funds from USFWS TOTAL $212,000.00
Kathy Kuletz salary (GS12 for 1 month/year x 5 yrs) = $55K David Irons salary (GS13 for 1 month/year x 5 yrs) = $55K
Boat user fee (180 days @ $300/day) = $54K
Equipment user fee @$12K/yr (computers, survival suits, electronics, etc.) = $36K
GSA vehicle user fee @ $4K/yr = $12K

FY12-16

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$100.0	$22.2	$100.0	$22.2	$100.0	$344.3
Travel	$11.6	$0.0	$11.8	$0.0	$11.8	$35.3
Contractual	$37.1	$0.0	$37.1	$0.0	$37.1	$111.3
Commodities	$34.6	$0.0	$38.8	$0.0	$43.0	$116.3
Equipment	$6.0	$0.0	$6.0	$0.0	$6.0	$18.0
SUBTOTAL	$189.3	$22.2	$193.6	$22.2	$197.8	$625.2
General Administration (9% of subtotal)	$17.0	$2.0	$17.4	$2.0	$17.8	$56.3
PROJECT TOTAL	$206.3	$24.2	$211.1	$24.2	$215.7	$681.4
Other Resources (Cost Share Funds)	$56.0	$22.0	$56.0	$22.0	$56.0	$212.0

COMMENTS: Cost share funds from USFWS TOTAL $212,000.00
Kathy Kuletz salary (GS12 for 1 month/year x 5 yrs) = $55K David Irons salary (GS13 for 1 month/year x 5 yrs) = $55K
Boat user fee (180 days @ $300/day) = $54K
Equipment user fee @$12K/yr (computers, survival suits, electronics, etc.) = $36K
GSA vehicle user fee @ $4K/yr = $12K

FY12-16

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4A TRUSTEE AGENCY SUMMARY

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Unknown - Project Leader	PWS Marine Bird Population Trends	8.0	7.4		59.2
Unknown - Supervisory Biological Science	PWS Marine Bird Population Trends	5.0	5.0		25.0
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
					0.0
					0.0
					0.0
		Subtotal	22.9	0.0	
				Personnel Total	$100.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Truck and boat tunnel fee (Portage - Whittier)	0.01	8			0.08
Per diem ($5/day), 9 people, 25 days summer			225	0.005	1.13
Per diem (travel rate), 9 people, 9 people, 2 days summer; 6 people for 3 d			36	0.17	6.12
Lodging, 6 nights, 3 rooms @ $120/night/room (Cordova)			18	0.12	2.16
Volunteer Tavel to Anchorage 2 people	1.0	2	2	0.08	2.16
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$11.6

FY12

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Charter vessel (summer - 7 days @ $3,500/day)	24.5
Harbor fees	0.6
Emergency boat repairs and parts	12.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$37.1

Commodities Costs: Description	Commodities Sum
Boat fuel (70 gal/boat/day) 60 boat-days summer @ $5/gal	21.00
Outboard oil (4 gal/boat/survey), 3 boats @ $20/gal	0.24
Food ($20/person/day) 9 people 13 days in summer	2.34
Misc. Commodities (cleaning supplies, replacement of emergency locator beacons, etc.	5.00
Boat Maintenance	6.00
Commodities Total	$34.6

FY12

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Emergency replacement of equipment	1.0	6.0	6.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
New Equipment Total			$6.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Survival Suits	9	FWS
Exposure Suits	9	FWS
Float Coats	9	FWS
Camping Supplies	9	FWS
dinghies	3	FWS
all other misc. equipment	UNK	FWS

FY12

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Unknown - Project Leader	PWS Marine Bird Population Trends	3.0	7.4		22.2
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	7.4	0.0	
				Personnel Total	$22.2

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY13

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B
PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY13

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Unknown - Project Leader	PWS Marine Bird Population Trends	8.0	7.4		59.2
Unknown - Supervisory Biological Science	PWS Marine Bird Population Trends	5.0	5.0		25.0
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
					0.0
					0.0
					0.0
		Subtotal	22.9	0.0	
				Personnel Total	$100.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Truck and boat tunnel fee (Portage - Whittier)	0.010	8			0.08
Per diem ($5/day), 9 people, 25 days summer			225	0.005	1.13
Per diem (travel rate), 9 people, 9 people, 2 days summer; 6 people for 3 d			36	0.175	6.30
Lodging, 6 nights, 3 rooms @ $120/night/room (Cordova)			18	0.120	2.16
Volunteer Tavel to Anchorage 2 people	1.000	2	2	0.075	2.15
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$11.8

FY14	**Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends**	**FORM 4B PERSONNEL & TRAVEL DETAIL**

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Charter vessel (summer - 7 days @ 3,500/day)	24.5
Harbor fees	0.6
Emergency boat repairs and parts	12.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$37.1

Commodities Costs: Description	Commodities Sum
Boat fuel (70 gal/boat/day) 60 boat-days summer @ $6/gal	25.20
Outboard oil (4 gal/boat/survey), 3 boats @ $20/gal	0.24
Food ($20/person/day) 9 people 13 days in summer	2.34
Misc. Commodities (cleaning supplies, replacement of emergency locator beacons, etc.	5.00
Boat Maintenance	6.00
Commodities Total	$38.8

FY14

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Emergency replacement of equipment	1.0	6.0	6.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$6.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Unknown - Project Leader	PWS Marine Bird Population Trends	3.0	7.4		22.2
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	7.4	0.0	
				Personnel Total	$22.2

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY15

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B
PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY15

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Unknown - Project Leader	PWS Marine Bird Population Trends	8.0	7.4		59.2
Unknown - Supervisory Biological Science	PWS Marine Bird Population Trends	5.0	5.0		25.0
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
					0.0
					0.0
					0.0
		Subtotal	22.9	0.0	
				Personnel Total	$100.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Truck and boat tunnel fee (Portage - Whittier)	0.010	8			0.08
Per diem ($5/day), 9 people, 25 days summer			225	0.005	1.13
Per diem (travel rate), 9 people, 9 people, 2 days summer; 6 people for 3 d			36	0.175	6.30
Lodging, 6 nights, 3 rooms @ $120/night/room (Cordova)			18	0.120	2.16
Volunteer Tavel to Anchorage 2 people	1.000	2	2	0.075	2.15
					0.00
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$11.8

FY16

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Charter vessel (summer - 7 days @ 3,500/day)	24.5
Harbor fees	0.6
Emergency boat repairs and parts	12.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$37.1

Commodities Costs: Description	Commodities Sum
Boat fuel (70 gal/boat/day) 60 boat-days summer @ $7/gal	29.40
Outboard oil (4 gal/boat/survey), 3 boats @ $20/gal	0.24
Food ($20/person/day) 9 people 13 days in summer	2.34
Misc. Commodities (cleaning supplies, replacement of emergency locator beacons, etc.	5.00
Boat Maintenance	6.00
Commodities Total	$43.0

FY16	**Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends**	**FORM 4B CONTRACTUAL & COMMODITIES DETAIL**

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Emergency replacement of equipment	1.0	6.0	6.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$6.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends

FORM 4B
EQUIPMENT DETAIL

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term monitoring: Benthic monitoring component **-** Long-term monitoring of Ecological Communities in Kachemak Bay: a comparison and control for Prince William Sound.

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Brenda Konar and Katrin Iken (UAF)
Co-operating Investigator: Angie Doroff (KBNERR)

Study Location:

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al.

Estimated Budget:
EVOSTC Funding Requested:
(breakdown by fiscal year and must include 9% GA)

Non-EVOSTC Funds to be used:
(breakdown by fiscal year)

Date: May 18, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Identify the problem the project is designed to address. Describe the background and history of the problem. Include a scientific literature review that covers the most significant previous work history related to the project.

Justification

Many protocol similarities exist between the monitoring that is currently being done in Prince William Sound (EVOSTC Project 10100750) and that which is being done in Kachemak Bay. By continuing this monitoring in both areas, comparisons can be made between the two regions and Kachemak Bay may be able to be used as a control for Prince William Sound if another spill were to occur. Historical data exist in both areas, making future comparisons of trends even more valuable.

Project Concept

This project will evaluate ecological communities in Kachemak Bay. Following protocols established for Prince William Sound, we will monitor sea otter abundance, diet and carcasses, seabird carcasses, marine debris, abundance and distribution of rocky intertidal plants and invertebrates, abundance and size frequency of clams and mussels on gravel beaches, and selected environmental parameters in Kachemak Bay. All protocols have been established and are described for Prince William Sound. These same protocols as will be used in this study. These Kachemak Bay data will be compared with those being collected in Prince William Sound and may be able to act as a control if an oil spill were to occur in the Sound again. The data will also be comparable to data being collected in Kenai and Katmai National Parks (National Park Service SWAN Nearshore Monitoring Program) using the same methods as used in Prince William Sound.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled “Long-Term Monitoring of Marine Conditions and Injured Resources and Services,” and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

List the objectives of the proposed research, the hypotheses being tested during the project, and briefly state why the intended research is important.

Objectives:

1) Determine trends in sea otter abundance.
2) Determine the diet and dietary shifts of sea otters.
3) Determine trends in sea otter and seabird mortality.
4) Determine trends in marine debris.

5) Determine trends in the abundance and distribution of rocky intertidal plants and invertebrates
6) Determine trends in the abundance and size frequency of clams and mussels on gravel beaches.
7) Determine trends in selected environmental parameters and relate them to #1-6 above.

The field work for this proposal will completed annually for four years and followed by a year of data synthesis (year 5), with the outlook of continuing this pattern of monitoring for up to 20 years.

B. Procedural and Scientific Methods

For each objective listed in A. above, identify the specific methods that will be used to meet the objective. In describing the methodologies for collection and analysis, identify measurements to be made and the anticipated precision and accuracy of each measurement and describe the sampling equipment in a manner that permits an assessment of the anticipated raw-data quality.

If applicable, discuss alternative methodologies considered, and explain why the proposed methods were chosen. In addition, projects that will involve the lethal collection of birds or mammals must comply with the Trustee Council's policy on collections, available at www.evostc.state.ak.us/Proposals/policies.htm.

Project Logistics

For this project, Brenda Konar and Katrin Iken will provide overall project management. They also will oversee the rocky intertidal and gravel beach portion of this study. This will include working with student field assistants, conducting the field work (including some collections of environmental parameters) and completing analyses. Angie Doroff will complete the sea otter foraging observations component of this project and will oversee some of the environmental parameter collections. The USFWS has tentatively committed to conducting sea otter abundance surveys (confirmation anticipated when 2011 federal budgets are determined). The Center for Alaska Coastal Studies, the Homer Marine Mammal Stranding Network, and the USFWS have been and will continue to conduct systematic beach walks to recover dead birds, sea otters, and marine debris.

The intertidal sampling effort in Kachemak Bay varied on both spatial and temporal scales (Table 1). Two different habitats were sampled, macroalgal covered rocky shores and seagrass beds (Figure 1). All data collected from Kachemak Bay have been shared with the Ocean Biogeographic Information System (OBIS, www.iobis.org) and are stored in a NaGISA/Census of Marine Life database.

C. Data Analysis and Statistical Methods

Describe the process for analyzing data. Discuss the means by which the measurements to be taken could be compared with historical observations or with regions that are thought to have similar ecosystems. Describe the statistical power of the proposed sampling program for detecting a significant change in numbers. To the extent that the variation to be expected in the *response variable(s) is known or can be approximated, proposals should demonstrate that the sample sizes and sampling times (for dynamic processes) are of sufficient power or robustness to adequately test the hypotheses. For environmental measurements, what is the measurement error associated with the devices and approaches to be used?*

D. Description of Study Area

Where will the project be undertaken? Describe the study area, including if applicable decimally-coded latitude and longitude readings of sampling locations or the bounding coordinates of the sampling region (e.g., 60.8233, -147.1029, 60.4739, -147.7309 for the north, east, south and west bounding coordinates). The formula for converting from degree minute seconds to decimal degrees is: degrees + (minutes/60) + (seconds/3600) so 121°8'6" = 121. + (8/60) + (6/3600) = 121.135

E. Coordination and Collaboration with Other Efforts

Indicate how your proposed project relates to, complements or includes collaborative efforts with other proposed or existing projects funded by the Trustee Council. Describe any coordination that has taken or will take place (with other Council funded projects, ongoing agency operations, activities funded by other marine research entities, etc.) and what form the coordination will take (shared field sites, research platforms, sample collection, data management, equipment purchases, etc.). If the proposed project requires or includes collaboration with other agencies, organizations or scientists to accomplish the work, such arrangements should be fully explained and the names of agency or organization representatives involved in the project should be provided. If your proposal is in conflict with another project, note this and explain why.

Project Integration

We expect strong collaboration between all components of this project with the Prince William Sound, Katmai and Kenai components (all nearshore monitoring with similar data collection methods) and the Oceanographic component. Data sharing is integral to the success of this program. This project will be integrated with two University of Alaska field courses that are taught by Konar and Iken at the Kasitsna Bay Lab. Students will get valuable experience and training from participating in this project and the project will benefit from having these students.

III. SCHEDULE

A. Project Milestones

For each project objective listed above (II.A.), specify when critical project tasks will be completed. Project reviewers will use this information in conjunction with annual project reports to assess whether projects are meeting their objectives and are suitable for continued funding. Please format your information like the following example.

Objective 1. Develop sediment-core chronologies in lake-productivity indicators.

To be met by September 2011

Objective 2. Compare sediment data corresponding to the past few decades to salmon population statistics.
To be met by December 2011

Objective 3. Reconstruct time-series of lake productivity, input of marine-derived nutrients, and salmon escapement.
To be met by April 2012

B. Measurable Project Tasks

Specify, by each quarter of each fiscal year, when critical project tasks (for example, sample collection, data analysis, manuscript submittal, etc.) will be completed. This information will be the basis for the quarterly project progress reports that are submitted to the Trustee Council Office. Please format your schedule like the following example.

FFY 11, 2nd quarter (January 1, 2011-March 31, 2011)
February: *Project funding approved by Trustee Council*

FFY 11, 3rd quarter (April 1, 2011-June 30, 2011)
April 30: *Core Upper Russian Lake*
May 30: *Core Delight Lake*

FFY 11, 4th quarter (July 1, 2011-September 30, 2011)
September 1: *Core Hidden Lake*

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)
December 15: *Begin analysis and report writing*

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)
January 18: *Annual Marine Science Symposium*

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)
April 15 *Submit final report. This will consist of a draft manuscript for publication to the Trustee Council Office.*

Budget Justification

Salary and benefits are being requested for the two PIs (Konar and Iken) to complete the field work and analysis. Additional summer salary is requested for a graduate student to assist Konar and Iken in the field and with the analysis. This student (which will likely change every year so that many can benefit) will receive valuable training and experience during this project. Travel is requested for the PIs and the graduate student to travel to the lab from UAF every summer to complete the field work. Contractual services requested are laboratory fees for bunk space and use of the lab at the Kasitsna Bay Laboratory, and a subcontract to Angie Doroff at the KBNERR to complete the sea otter component of this study. Commodities requested include general supplies (food while in the field, pressing paper for algal vouchers, vials for invertebrate vouchers, collecting bags, ziplocks, etc…) and data loggers.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$20.0	$20.7	$21.3	$22.0	$21.8	$105.8
Travel	$1.0	$1.0	$1.0	$1.0	$1.0	$5.0
Contractual	$6.4	$5.9	$5.2	$4.5	$4.5	$26.5
Commodities	$2.1	$2.0	$2.0	$2.0	$1.5	$9.6
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$14.6	$14.6	$14.6	$14.6	$14.7	$73.1
SUBTOTAL	$44.1	$44.2	$44.1	$44.1	$43.5	$220.0
General Administration (9% of subtotal)	$4.0	$4.0	$4.0	$4.0	$3.9	$19.8
PROJECT TOTAL	$48.1	$48.2	$48.1	$48.1	$47.4	$239.8
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In this box, identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

FY12-16

Program Title:
Team Leader:

SUMMARY

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$20.0	$20.7	$21.3	$22.0	$21.8	$105.8
Travel	$1.0	$1.0	$1.0	$1.0	$1.0	$5.0
Contractual	$6.4	$5.9	$5.2	$4.5	$4.5	$26.5
Commodities	$2.1	$2.0	$2.0	$2.0	$1.5	$9.6
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$14.6	$14.6	$14.6	$14.6	$14.7	$73.1
SUBTOTAL	$44.1	$44.2	$44.1	$44.1	$43.5	$220.0
General Administration (9% of subtotal)	$4.0	$4.0	$4.0	$4.0	$3.9	$19.8
PROJECT TOTAL	$48.1	$48.2	$48.1	$48.1	$47.4	$239.8
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In this box, identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

FY12-16

Program Title:
Team Leader:

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Brenda Konar	PI	0.5	12.3		6.2
Katrin Iken	co-PI	0.5	11.3		5.7
MS Graduate Student	Student	2.0	4.1		8.2
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	27.7	0.0	
				Personnel Total	$20.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Travel to Kasitsna Bay Laboratory	1.0	1			1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY12

Program Title:
Team Leader:

FORM 3B
PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Kasitsna Bay Laboratory Fees	2.4
Angie Doroff KBNERR	4.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$6.4

Commodities Costs: Description	Commodities Sum
Project Supplies	1.1
Data Loggers	1.0
Commodities Total	$2.1

FY12	Program Title: Team Leader:	FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Brenda Konar	PI	0.5	12.8		6.4
Katrin Iken	co-PI	0.5	11.8		5.9
MS Graduate Student	Student	2.0	4.2		8.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	28.8	0.0	
				Personnel Total	$20.7

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Travel to Kasitsna Bay Laboratory	1.0	1			1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY13

Program Title:
Team Leader:

FORM 3B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Kasitsna Bay Laboratory Fees	1.9
Angie Doroff KBNERR	4.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$5.9

Commodities Costs: Description	Commodities Sum
Project Supplies	1.0
Data Loggers	1.0
Commodities Total	$2.0

FY13

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Brenda Konar	PI	0.5	13.4		6.7
Katrin Iken	co-PI	0.5	12.4		6.2
MS Graduate Student	Student	2.0	4.2		8.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	30.0	0.0	
				Personnel Total	$21.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Travel to Kasitsna Bay Laboratory	1.0	1			1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY14

Program Title:
Team Leader:

FORM 3B
PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Kasitsna Bay Laboratory Fees	1.2
Angie Doroff KBNERR	4.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$5.2

Commodities Costs: Description	Commodities Sum
Project Supplies	1.0
Data Loggers	1.0
Commodities Total	$2.0

FY14

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Brenda Konar	PI	0.5	13.9		7.0
Katrin Iken	co-PI	0.5	12.9		6.5
MS Graduate Student	Student	2.0	4.3		8.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	31.1	0.0	
				Personnel Total	$22.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Travel to Kasitsna Bay Laboratory	1.0	1			1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY15

Program Title:
Team Leader:

FORM 3B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Kasitsna Bay Laboratory Fees	0.5
Angie Doroff KBNERR	4.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$4.5

Commodities Costs: Description	Commodities Sum
Project Supplies	1.0
Data Loggers	1.0
Commodities Total	$2.0

FY15

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Brenda Konar	PI	0.5	14.6		7.3
Katrin Iken	co-PI	0.5	13.5		6.8
MS Graduate Student	Student	1.8	4.3		7.7
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	32.4	0.0	
				Personnel Total	$21.8

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Travel to Kasitsna Bay Laboratory	1.0	1			1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY16

Program Title:
Team Leader:

FORM 3B
PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Kasitsna Bay Laboratory Fees	0.5
Angie Doroff KBNERR	4.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$4.5

Commodities Costs: Description	Commodities Sum
Project Supplies	0.5
Data Loggers	1.0
Commodities Total	$1.5

FY16

Program Title:
Team Leader:

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term Monitoring: Pelagic monitoring component - Long-term killer whale monitoring in Prince William Sound/ Kenai Fjords

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Craig O. Matkin, Principal Investigator
Eva Saulitis, Co-operating Investigator
Graeme Ellis Co-operating Investigator
John Durban Co-operating Investigator
Ward Testa Co-operating Investigator

Study Location: Prince William Sound/ Kenai Fjords

Abstract:
The proposed project is a continuation of the monitoring of AB pod and the AT1 population killer whale populations in Prince William Sound on an annual basis. These groups of whales suffered serious losses at the time of the oil spill and have not recovered at projected rates. Monitoring of all the major pods and their current movements, range, feeding habits, and contaminant levels will help determine their vulnerability to future perturbations, including oil spills. The project also extends the scope of the basic monitoring to include an innovative satellite tagging program used to examine habitat preference, feeding ecology and assist in relocating whales for feeding studies. It continues examination of feeding habits using observational and innovative chemical techniques. The study will delineate important habitat, variations in pod specific movements and feeding behavior within a temporal and geographic framework. We will describe the role of both fish eating and mammal eating killer whales in the near-shore ecosystem and their impacts on prey species. Community based initiatives, educational programs, and programs for tour boat operators will continue to be integrated into the work to help foster restoration by improving public understanding and reducing harassment of the whales

Estimated Budget:
EVOSTC Funding Requested: $494.2K without 9%GA; $538.7K with 9%GA
(breakdown by fiscal year and must include 9% GA)

FY12 -$7.2K	FY13 - $132.8K	FY14 - $132.8K	FY15 - $132.9K	FY16 - $132.9K	TOTAL $538.7K

Non-EVOSTC Funds to be used:
(breakdown by fiscal year)

Date: May 31, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT
A. Statement of Problem

Justification

Both resident ecotype (AB pod) and transient ecotype (AT1 population) killer whales suffered significant mortalities following the *Exxon Valdez* oil spill in 1989. AB pod is recovering after 22 years but has still not reached pre-spill numbers. The AT1 population is not recovering and may be headed toward extinction. This project has determined that killer whales are sensitive to perturbations such as oil spills, but has not yet determined the long term consequence (extinction) or the recovery period required for AB pod. As an APEX predator, this species has impact on the ecosystem (fish and marine mammals); additionally they are a primary focus of viewing for a vibrant tour boat industry in the region, and can be closely monitored. This is a unique opportunity to continue a comprehensive database for a keystone species in the region. The wisdom of long-term killer whale monitoring has been borne out in other regions such as Puget Sound and British Columbia. Data from this project is used by tourboats in the region to enhance viewers experience and understanding of the local environment and fauna.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

Project Concept

This project will continue monitoring of individual killer whales through photoidentification and maintain individual histories that allows continued development of our population dynamics model. It maintains monitoring of blubber chemistry that regularly assesses contaminant levels and changes in dietary habits. Finally we will continue monitoring movement data through resighting by photoidentification and tracking with ARGOS satellite tags. This yields pod and group specific information on range and preferred habitat and aids in determination of the vulnerability of specific groups to regional perturbations (eg which pods would be most susceptible to another oil spill in the Sound). Additionally satellite tracking allows relocating groups of whales, greatly facilitating the overall monitoring effort.

Objectives:

1) Photo-identification of all major resident pods and AT1 transient groups that use Prince William Sound/Kenai Fjords on an annual basis. Realistically, all pods are completely documented on a biennial basis, despite annual field effort. Extension of individual

histories, identification catalogues of individuals and an annual update of population model are products of these data.

2) Collection of blubber samples for chemical monitoring of PCBs, DDT's and PBDE's, lipids /fatty acids and stable isotope values to gauge changes in contaminant loads as well as feeding habit changes. Most analytical costs are borne by NOAA fisheries.

3) Collection of fish scale samples and marine mammal tissue from kill sites to monitor potential changes in feeding habits

4) Collection of genetic tissue samples (Genetic analytical costs paid by NMML/UBC)

5) Tracking of individuals/pods using ARGOS satellite telemetry to improve re-sighting rate and foster completion of objectives 1-3. Use of time/depth recorders to examine feeding patterns and diel behavior

6) Determine details of range of pods/populations using both ARGOS and photoidentification data and identify important habitat on a pod specific basis

The field work consists of three major activities. First, photo-identification will be completed using Nikon D700 digital cameras to obtain photos of every individual in major resident pods and AT1 trasnsient groups, as well as of other killer whales that are encountered. (Humpback whales are photographed opportunistically as time allows.) Second, biopsy samples for chemical analysis and genetics will be collected using an air powered rifle and small floating biopsy darts that are easily retrieved. This technique has been used since 1994. Finally, ARGOS Spot 5 satellite tags manufactured by Wildlife computers will be attached with specially designed darts to specific whales to track movements over periods ranging from weeks to months.

Survey days and encounter data is logged in an Access database maintained by NGOS and the Alaska Sea Life Center. Data analysis includes a frame by frame analysis of all digital images, with individual identifications digitally recorded and attached to the photo. Improvement photos of each individual are selected and placed in appropriate folders and used to update catalogue (for NGOS and public access) and provide reference for future identifications. The population dynamics data base that lists data on each individual (including newly recruited calves) is updated annually. All vessel and encounter tracklines are stored in GIS format, ready for analysis. ARGOS tracklines are also placed in GIS format and initial analysis and mapping completed on an annual basis.

<u>Project Integration</u>

This project is a continuation of the longest running photo-identification, movement, and blubber chemistry database for any small cetacean in Alaska and has been supported by the Trustee Council for 22 years. This database extend back to 1984 and has made assessement of damages to killer whales possible both during interactions with long-line fishermen and following the *Exxon Valdez* oil spill. Additionally, during killer whale monitoring we have opportunistically collected substantial individual ID/population data on humpback whales during spring, summer, and early fall and will continue to do so to complement the proposed fall/winter humpback monitoring program. The proposed winter humpback monitoring program will opportunistically collect killer whale data to complement our seasonal data collection.

B. Procedural and Scientific Methods

Our work depends on accurate photo-identification of each individual in each pod/group that regularly uses the Sound, particularly AB pod and the AT1 population. It is important that researchers maximize the time actually spent with resident killer whales (particularly AB pod and other resident whales) to insure thorough identification of all individuals and meet other objectives of this proposal which now amended to include satellite tracking and detailed food habits evaluation.

Methods proposed to obtain photographic data necessary to meet monitoring objectives will be similar to those used by the NGOS in Prince William Sound/Kenai Fjords for the past 24 years. Searches for whales will not be made on random transects, but based on current and historical sighting information. In addition whales will be located by listening for killer whale calls with a directional hydrophone (calls can be heard up to 10 miles away), or by responding to VHF radio calls from other vessels reporting sightings of whales. We have developed network of cooperating vessel owners and tour boat operators that regularly report whale sightings. In addition, requests for recent killer whale sightings will be made routinely on hailing Channel 16 VHF and working channel 72. Finally, we will use satellite tracking positions, when possible, to direct searches for individuals and groups.

A vessel log and chart of the vessel track will kept for each day the research vessels operate. Nobletech software and a laptop computer configured with GPS will automatically record the research vessel track in real time. The elapsed time and distance traveled will be recorded and vessel track plotted. Record will be made of the time and location of all whale sightings and the weather and sea state noted at regular intervals.

Data from each encounter will be stored in an access database and trackline and all vessel and whale tracklines stored in a GIS database. This data system will be used in 2010-12 to log all encounters and summarize effort. Data recorded will include date, time, duration, and location of the encounter. Rolls of film exposed and the estimated number of whales photographed will also be recorded. A chart of the whales' track line during the encounter will be completed and the distance traveled by the vessel with the whales will be calculated by GIS on a daily basis. We will link general behavior of the whales (i.e. feeding, resting, traveling, socializing, milling) to location and time.

Photographs for individual identification will be taken of the port side of each whale showing details of the dorsal fin and gray saddle patch. Photographs will be taken at no less than 1/1000 sec using Fuji Neopan 1600, a high speed black and white film. A Nikon F-100 auto focus camera with internal motor drive and a 300 mm f4.5 auto focus lens will be used. Digital photographs are taken as a backup using a Nikon D200 SLR camera, but film is still our primary recording medium. When whales are encountered, researchers will systematically move from one subgroup (or individual) to the next keeping track of the whales photographed. If possible, individual whales will be photographed several times during each encounter to insure an adequate identification photograph. Whales will be followed until all whales are photographed or until weather and/or darkness make photography impractical.

All photographic negatives will be examined under a Wild M5 stereomicroscope at 9.6 powers. Identifiable individuals in each frame will be recorded. When identifications are not certain, they will not be included in the analysis. Unusual wounds or other injuries will be noted. Photographic negatives will be analyzed using a photographic database that spans 24 years.

Recently we have developed the ability to make remote attachments of satellite transmitters to killer whales using a crossbow arrangement and small barbed tag that attaches to the dorsal fin of the whale. Re-sighting data indicates minimal scarring after the tag drops off. The position-only satellite transmitter that we are proposing to deploy is approximately 3.8 cm in diameter in a half dome shape, with a maximum height of 2.2 cm. The transmitting antenna is approximately 1.5 mm in diameter and 17 cm long sticking out of the center of the half dome. On the flat side, opposite the point of the antenna protrusion will be one or two barbed attachment post that will be 5 cm long and 0.6 cm in diameter. Attachments will be made from distances of approximately 6-8 meters using either a crossbow (e.g. Barnett Wildcat 170 pound bow or similar). Uplink schedules are set prior to tagging and data received through the Argos satellite system. We have had attachment times of up to 2 months in our tagging in Prince William Sound in 2007 and 2008. Reaction to application of the tags is slight and scarring after the tag drops off is minimal based on re-sight data from animals tagged in 2006. As part of this project we will attempt to place an average of seven tags per year 2010-2012, extending our examination of the ranges of various key groups over the season. We will examine variations in habitat use by the different pods as well as looking at the detailed movements of individuals. When possible we will access positions from the field on a daily basis to find individuals, in addition to compiling a long term record of movements.

Field observations of feeding will be made and prey parts collected when possible. Scales are retrieved from fish predations events and read for species and age at the Pacific Biological Station in Nanaimo, British Columbia, where a scale laboratory has been established and certified for over 20 years. If mammal prey species cannot be identified visually, then genetic analysis will be conducted if bits of prey remains are collected. The University of British Columbia, Department of Zoology genetics laboratory maintains a reference collection of genetic markers for each marine mammal species and will conduct species identification analysis.

Project Logistics

Annual monitoring is a time consuming process, requiring 50 days of field time to insure the continuation of data sets on the major resident pods (including AB pod) and important transient groups. Even with this amount of time, complete coverage typically occurs on a biennial basis. We request a base vessel lease of 40 days/year from EVOS funds. NGOS will supply an additional 10-20 days of survey time via foundation grants or other funding. Since the PI and others involved in the project are experienced vessel operators, no paid captain is necessary. Approximately 50% of the costs of monitoring of contaminants and blubber chemistry (via Northwest Fisheries Science Center) with the remaining 12 K in funds supplied by NWFSC. Major commodities(other than food and fuel) include 8 ARGOS tags. Included in the budget is 5 months salary for the PI and 2.5 months salary for a field biologist. Funded non-field activities include photographic analysis, data input and analysis, updating of photo-catalogue and supplying digital version to tourboat companies, GIS analysis of effort data, encounter data, and satellite tag data; and ongoing population dynamics analysis. Reports are the responsibility of the PI.

C. Data Analysis and Statistical Methods

Because photographic and observational data are being made in the same format as during the past 23 field seasons and using the techniques now standardized for studying killer whales, the data will be comparable with other data collected around the North Pacific. Since we identify every individual in each pod of resident killer whales, and pod membership only changes through death or calf production, we can accurately assess changes in pods/population.

The report for the monitoring segment will include a summary of all field effort including that funded outside of this DPD, and will include a summary of the pods and individuals encountered and a status report on AB pod and the AT1 group. Changes within AB pod will be examined with consideration for the age and sex structure of the pod and maternal groups within the pod and related to the population model now under development. Trends in transient killer whale sighting rates and demographics will also be presented.

Feeding data will be summarized and field observations and data from scales (species and age) will be summarized and statistically compared by area and by pod. In conjunction with the NWFSC we have used contaminant/fatty acid/stable isotope analysis to describe aspects of killer whale predation in other areas (Herman et al 2005, Krahn et al 2006, see Data Management and Quality Assurance). Analysis and publication for this aspect of the project will follow the model presented in these papers. We will also statistically compare chemical markers indicative of diet between pods and from different times of year (late winter/spring and late summer/fall). In our field sampling will take into account that chemical markers usually indicate prey from approximately two months prior to the sample in temporal comparisons. Genetic analysis, when appropriate, will be conducted using the methods detailed in Matkin et al (2003) and Barrett-Lennard 2000 and will include mtDNA and nuclear DNA analysis. Track lines from whales tagged with satellite tracking devices will be presented and analyzed in GIS format. Tracks will be examined for patterns in movements, and in relation to bathymetry, to known migratory pathways of prey and to areas of potential prey abundance. We will establish home range estimates and kernel density estimates to determine important habitat and migratory pathways.

Frame by frame identifications of individuals tabulated by pod and by individual and added to our database. Frame by frame identification data will also be made available on disk. Copies of the GIS program and data base will be available by request to NGOS.

PC (Windows) compatible computers owned by NGOS will be used to analyze field data. The various long-term databases will be housed at NGOS offices and the Alaska Sea Life Center, although copies will be made available to other management agencies on request.

D. Description of Study Area

This project is part of an ongoing killer whale research in Prince William Sound and the Kenai Fjords region, Alaska (Matkin et al 2008). The overall study area stretches from the Nuka Bay, outer Kenai Peninsula region to Cordova on the eastern edge of Prince William Sound. However, the funding specifically requested in this proposal will be used primarily in western Prince William Sound and Kenai Fjords where likelihood of encountering the focal whales is most likely. We cannot predict the specific locations where encounters will occur.

E. Coordination and Collaboration with Other Efforts

The monitoring of killer whales and analysis of current data is part of a long-term program to investigate killer whale recovery, monitor populations and examine the interactions of killer whales with other species. The PI, Matkin, will work closely with collaborators Russ Andrews at the Alaska Sea Life Center, who has designed the satellite tags and with Dave Herman and Peggy Krahn at the Northwest Fisheries Science Center, who conduct diet and contaminant analysis, and Kim Parsons who conducts the genetic analysis. We have been and will continue to be active collaborators on the studies examining the interaction of humpback whales and herring (see other projects, Jeep Rice, PI) and have contributed our substantial long-term humpback whale photo database to their analysis. We will continue to collect humpback whale fluke identification data during the course of the proposed work and share research platforms when possible. As possible the proposed study will be integrated with near shore studies that focus on sea otters and with the oceanographic studies of the Alaska Coastal Current.

This project will rely on approximately $15,000 annually in additional analytical time provided by the NWFSC, Environmental Contaminant Laboratory, $5000.00 annually in additional vessel time contributed by NGOS, and $3500 annually by the Norcross Foundation in equipment. In addition we are supported and work cooperatively with the NMFS regional office (Aleria Jensen) in providing observation and education of the tour boat fleet in the Prince William Sound/Kenai Fjords region. As a non-profit research institution familiar with private funding sources and cooperative programs, NGOS can work with the Trustee Council to maximize return for current and future funding.

III. SCHEDULE

A. Project Milestones

Objective 1. To prepare and launch field collection of data, including identification photos, prey samples and observations, biopsy samples and satellite tag attachments. Field work will begin in April 2012 and end by October 2016.

Objective 2. Conduct analysis blubber samples, scale samples, skin samples, and plot results of tagging efforts. Conducted **annually**, completion date for all laboratory analysis is February 2017

Objective 3. Annual update photographic catalogue, Argos tracking data, and population dynamics database. Statistical analysis and compilation of data from all years of the project to be published and included in final report (draft by April 2017)

B. Measurable Project Tasks

FY12, 1st quarter (October 1, 2011-December 31, 2011) *(Funded by FY11 money)*

Funding obtained from EVOS Trustee Council, prepare for initiation of project Our project year begins in January

FY12, 2nd quarter (January 1, 2012-March 31, 2012) *(Funded by FY11 money)*

January - Annual Marine Science Symposium. Compilation of previous data, preparation for field work

FY12, 3rd quarter (April 1, 2012-June 30, 2012)

Intiate annual field work. Conduct fieldwork in April (10 days) May (7days) and June (7 days).

FY12, 4th quarter (July 1, 2012- September 30, 2012)

Conduct fieldwork in August (10 days) and September-November (16 days) Initiate analysis of 2012 data

FY13, 1st quarter (October 1, 2012-December 31, 2012)

Workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope, prey sample and genetic analysis.

FY13, 2nd quarter (January 1, 2013-March 31, 2013)

January 23-27 Annual Marine Science Symposium Finish analysis of photographs from fieldwork and update catalogue. Workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope and genetic analysis completion

FY13, 3rd quarter (April 1, 2013-June 30, 2013)

Prepare for April field work Conduct fieldwork in April (7days) May (7days) and June (8days)

FY13, 4th quarter (July 1, 2013- September 30, 2013)

Conduct fieldwork in July-August (14 days) and September-November (14 days) Initiate analysis of 2013 data.

FY14, 1st quarter (October 1, 2013-December 31, 2013)

Workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope and genetic analysis.

FY14, 2nd quarter (January 1, 2014-March 31, 2014)

January 23-27 Annual Marine Science Symposium. Finish analysis of photographs from fieldwork catalogue, workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope, prey sample and genetic analysis completion.

FY14, 3rd quarter (April 1, 2014-June 30, 2014)

Prepare for April field work Conduct fieldwork in April (10 days) and May- June (10 days)

FY14, 4th quarter (July 1, 2014- September 30, 2014)

Conduct fieldwork in July-August (14 days) and September-November (14 days) Initiate analysis of 2014 data.

FY15, 1st quarter (October 1, 2014-December 31, 2014)

Workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope and genetic analysis.

FY15, 2nd quarter (January 1, 2015-March 31, 2015)

January Annual Marine Science Symposium. Finish analysis of photographs from fieldwork catalogue, workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope, prey sample and genetic analysis completion.

FY15, 3rd quarter (April 1, 2015-June 30, 2015)

Prepare for April field work Conduct fieldwork in April (10 days) and May- June (10 days)
FY15, 4th quarter (July 1, 2015- September 30, 2015)
Conduct fieldwork in July-August (14 days) and September-November (14 days) Initiate analysis of 2015 data.

FY16, 1st quarter (October 1, 2015-December 31, 2015)
Workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope and genetic analysis.
FY16, 2nd quarter (January 1, 2016-March 31, 2016)
January Annual Marine Science Symposium. Finish analysis of photographs from fieldwork catalogue, workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope, prey sample and genetic analysis completion.
FY16, 3rd quarter (April 1, 2016-June 30, 2016)
Prepare for April field work Conduct fieldwork in April (10 days) and May- June (10 days)
FY16, 4th quarter (July 1, 2016- September 30, 2016)
Conduct fieldwork in July-August (14 days) and September-November (14 days) Initiate analysis of 2016 data.

FY17, 1st quarter (October 1, 2016-December 31, 2016) *Funded by FY16 money*
Workup satellite tag data in GIS format and update databases. Lipid/fatty acid, contaminant, stable isotope prey sample and genetic analysis completion.
FY17, 2nd quarter (January 1, 2017-March 31, 2017) *Funded by FY16 money*
January Annual Marine Science Symposium. Final analysis and preparation of final report

Budget Justification

	FY2012	FY2013-16 (ANNUALLY)
Personnel	0	$34,250.0
Travel	0	$1,400.0
Contractual	0	$38,500.0
Commodities	$5995	$36,200.0
Equipment	$0.0	$0.0
Indirect	$600	$11,500.0

Because our annual project funding cycle begins in January, there will be overlap from previous years funding into the next fiscal year in all years of the project. Although funding was previously awarded for 2012, some costs for consistent continuation of the project (late field season) and were not included in that budget/contract and our included here ($6595)

FY 2012 Money for late season operations and commodities not covered in original award for FY 2010-2012. Will allow a seamless transition into FY2013-16 program.

Personnel: FY 2013-FY2016

Includes costs for the PI/Lead Field Biologist/Boat operator for each year, his time in annual analysis and reporting and includes the FY 2013 reporting costs. P.I. Matkin will supervise all aspects of the project and all contractors. Also included is annual is funding for an assistant field biologist/analyst for each year

Travel: FY2013-FY2016

Includes funds for travel and per diem for the Alaska Marine Science Symposium for each year of the project for the PI, Matkin

Contractual: FY2013-FY2013

This includes a majority of the vessel leases (40 days/year) with the remainder (10 days/year) supplied by NGOS funds. It also includes about 50% of the costs of chemical analysis of samples with the remainder supplied by the Northwest Fisheries Science Center. Also included is the cost of photographic analysis and cataloguing, GIS analysis of both effort data and tag data, and statistical analysis as necessary

Commodities: FY2013-2016

This category includes the constantly improved satellite tags, with eight purchased in each year. Fuel and food for the vessel is included as well as photographic and printing costs, the cost for sat phone and cell phone time, tracking time with the ARGOS satellite system, shipping costs and miscellaneous minor supplies

Indirect: FY2013-2016

For all years these costs include the use of NGOS owned field equipment including cameras and lenses, hydrophones and digital recorders, biopsy rifles and sampling equipment, tag application equipment, satellite phones and cell phones, prey sampling nets, battery chargers and inverters and the use of NGOS vehicles. Also included is expense for use of office, accounting and bookkeeping expenses, internet, phone, fax machine and use of NGOS computers both in the field and in the office and the preparation of tax documents and associated non-profit management expenses.

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$34.3	$34.3	$34.3	$34.3	$137.0
Travel	$0.0	$1.4	$1.4	$1.5	$1.5	$5.8
Contractual	$0.0	$38.5	$38.5	$38.5	$38.5	$154.0
Commodities	$6.0	$36.2	$36.2	$36.2	$36.2	$150.8
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$0.6	$11.5	$11.5	$11.5	$11.5	$46.6
SUBTOTAL	$6.6	$121.9	$121.9	$122.0	$122.0	$494.2
General Administration (9% of subtotal)	$0.6	$11.0	$11.0	$11.0	$11.0	$44.5
PROJECT TOTAL	$7.2	$132.8	$132.8	$132.9	$132.9	$538.7
Other Resources (Cost Share Funds)	$23.5	$23.5	$23.5	$23.5	$23.5	$117.5

Annually:15,000 Northwest Fisheries Science Center, Environmental Contaminant Lab: additional analytical and reporting services.
3,500 Norcross Wildlife Foundation, Equipment grant 5,000 NGOS in kind equiment use

FY12

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3A
NON-TRUSTEE
AGENCY SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs: Name	Project Title	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY12

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Satellite Tags	5.0
Fuel	1.0
Commodities Total	$6.0

FY12

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
						0.0
Craig Matkin	P.I. Field Biologist		5.0	5.1		25.5
Eva Saulitis	Field Biologist/Data analysis		2.5	3.5		8.8
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	8.6	0.0	
					Personnel Total	$34.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
Attend annual Alaska Marine Science Symposium	0.8	1	3	0.2	1.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.4

FY13

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Vessel Lease (R.V. Natoa/ 40 days @500/day)	20.0
NWFSC Environmental Contaminant Lab, Analytical Fees	12.0
GIS/Statistical Analysis	3.0
Photoidentification/Catalogue	3.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$38.5

Commodities Costs: Description	Commodities Sum
Misc tagging and biopsy supplies	2.0
8 satellite tags @3000 apiece	24.0
Field Food ($40/day for 40 days)	1.6
Fuel ($150/day for 40 days)	6.0
Film, Photo processing	1.8
Field Communication, Tracking, Shipping, and Misc supplies	0.8
Commodities Total	$36.2

FY13

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
						0.0
Craig Matkin	P.I. Field Biologist		5.0	5.1		25.5
Eva Saulitis	Field Biologist/Data analysis		2.5	3.5		8.8
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	8.6	0.0	
					Personnel Total	$34.3

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
Attend annual Alaska Marine Science Symposium	0.8	1	3	0.2	1.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.4

FY14

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Vessel Lease (R.V. Natoa/ 40 days @500/day)	20.0
NWFSC Environmental Contaminant Lab, Analytical Fees	12.0
GIS/Statistical Analysis	3.0
Photoidentification/Catalogue	3.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$38.5

Commodities Costs: Description	Commodities Sum
Misc tagging and biopsy supplies	2.0
8 satellite tags @3000 apiece	24.0
Field Food ($40/day for 40 days)	1.6
Fuel ($150/day for 40 days)	6.0
Film, Photo processing	1.8
Field Communication, Tracking, Shipping, and Misc supplies	0.8
Commodities Total	$36.2

FY14

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
						0.0
Craig Matkin	P.I. Field Biologist		5.0	5.1		25.5
Eva Saulitis	Field Biologist/Data analysis		2.5	3.5		8.8
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	8.6	0.0	
					Personnel Total	$34.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
Attend annual Alaska Marine Science Symposium	0.9	1	3	0.2	1.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.5

FY15

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Vessel Lease (R.V. Natoa/ 40 days @500/day)	20.0
NWFSC Environmental Contaminant Lab, Analytical Fees	12.0
GIS/Statistical Analysis	3.0
Photoidentification/Catalogue	3.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$38.5

Commodities Costs: Description	Commodities Sum
Misc tagging and biopsy supplies	2.0
8 satellite tags @3000 apiece	24.0
Field Food ($40/day for 40 days)	1.6
Fuel ($150/day for 40 days)	6.0
Film, Photo processing	1.8
Field Communication, Tracking, Shipping, and Misc supplies	0.8
Commodities Total	$36.2

FY15

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
						0.0
Craig Matkin	P.I. Field Biologist		5.0	5.1		25.5
Eva Saulitis	Field Biologist/Data analysis		2.5	3.5		8.8
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	8.6	0.0	
					Personnel Total	$34.3

Travel Costs: Description	Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
					0.0
Attend annual Alaska Marine Science Symposium	0.9	1	3	0.2	1.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.5

FY16

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Vessel Lease (R.V. Natoa/ 40 days @500/day)	20.0
NWFSC Environmental Contaminant Lab, Analytical Fees	12.0
GIS/Statistical Analysis	3.0
Photoidentification/Catalogue	3.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$38.5

Commodities Costs: Description	Commodities Sum
Misc tagging and biopsy supplies	2.0
8 satellite tags @3000 apiece	24.0
Field Food ($40/day for 40 days)	1.6
Fuel ($150/day for 40 days)	6.0
Film, Photo processing	1.8
Field Communication, Tracking, Shipping, and Misc supplies	0.8
Commodities Total	$36.2

FY16

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
EQUIPMENT DETAIL

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term Monitoring: Pelagic Monitoring Component **-** Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): John R. Moran (NOAA) and Janice M. Straley (UAS)
Co-operating Investigator: Terrence J. Quinn II (UAF)

Study Location: Prince William Sound

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al.

We will evaluate the impact by humpback whales on Pacific herring populations in Prince William Sound. Following protocols established during the winters of 2007/08 and 2008/09(EVOSTC project PJ090804). We will continue to monitor the seasonal trends and abundance of humpback whales in Prince William Sound. Prey selection by humpback whales will be determined through acoustic surveys, visual observation scat analysis and prey sampling. Chemical analysis of blubber samples (stable isotopes and fatty acid analysis) will provide a longer term perspective on whale diet and shifts in prey type. These data will be combined in a bioenergetic model to determine numbers of herring consumed by whales, with the long term goal of enhancing the age structure modeling of population with better estimates of predation mortality.

Estimated Budget: : $543K total without 9%GA - $591.9K with 9%GA
EVOSTC Funding Requested:
(breakdown by fiscal year and must include 9% GA)

Fy12 - $116.9K	FY13 - $118.2K	FY14 - $128.1K	FY15- $129.9K	FY16 - $49.9K

Non-EVOSTC Funds to be used:

FY12- $25.0	FY13 -$25.0	FY14 -$25.0	FY15 -$25.0	FY16 -$25.0

Date: May 31, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Humpback whale predation has been identified as a significant source of mortality on wintering Pacific herring in Prince William Sound (EVOSTC project PJ090804). At current herring and whale population levels the loss of pre-spawning herring during the fall and winter months is equivalent to the percentage of herring removed during the final years of the commercial herring fishery. Hence, top down forces (predation and disease) are the likely dominating forces constraining the current recovery. Humpback whales in Prince William Sound have a higher percentage of herring in their diet during the winter months and forage longer on wintering herring shoals than their counterparts in Southeast Alaska. With humpback whale population in the North Pacific increasing at 5-7% annually, there is a need to continue evaluating predation pressure on herring until stocks in Prince William Sound fully recover, and to proceed toward enhancing the age structure model to include a better estimate of predation for a more accurate predictor of the herring population.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

Objectives:

1) *Population estimates of humpback whales through the use of photographic mark-recapture models.* Knowing the number of whale present in PWS is essential for assessing their impact on the PWS ecosystem.

2) *Monitor the seasonal trends of humpback whales in Prince William Sound relative to prey.* EVOSTC project PJ090804 identified an correlation between the movements of whales and herring in PWS

3) *Estimate inter-annual trends in humpback whale abundance.* This objective allows us to determine if the conclusion from EVOSTC project PJ090804 are an anomaly or typical whale behavior in PWS.

4) *Determine the diet and dietary shifts of humpback whales.* A shift in prey by whales can have profound effects on herring (i.e. in Southeast Alaska, when euphausiids become available pressure on herring by whales is greatly reduced).

5) *Estimate predation rates on herring by humpback whales.* This objective quantifies predation pressure on herring for PWS.

6) *Incorporate mortality rates into herring age structure models.* This is the management component of the study, can predation whales explain fluctuations in herring populations.

The field work for this proposal will center around three (~6 days) cruises each year during the fall and winter months for years 1-4 followed by a year of data synthesis (year 5), with the outlook of continuing this pattern of monitoring for up to 20 years. Additional information on the seasonal abundance and distribution of humpback whales will be obtained using opportunistic surveys throughout the year by local residents and boat operators, as well as photo ID contributed by the killer whale project in the summers.

<u>Project Integration</u>

We expect strong collaboration between humpback whale, killer whale and seabird components of the pelagic monitoring projects. The proposed killer whale monitoring program will opportunistically collect humpback whale data during summers; likewise the observation of killer whales will be documented during winter humpback whale cruises. We will be able to provide a berth for a seabird observer on all humpback whale cruises.

B. Procedural and Scientific Methods

Population estimates of humpback whales through the use of photographic mark-recapture models.

We will use Nikon D-300, D-200, and D-70 cameras with 80-200 mm lenses to capture digital images of the ventral side of humpback whale flukes to identify individuals. All photographs were ranked as good, fair, poor, and insufficient quality. Photographs deemed poor or of insufficient quality were excluded from the mark-recapture analysis to avoid potential bias from matching errors. Further, photographs of humpback whale calves were also excluded, this is because the capture probability for a calf is complicated by their co-occurrence with their mothers (and is therefore not independent), and the probability of recapture in later years can be difficult as calf flukes tend to change more than adult flukes.

Time series of humpback whale abundance will be constructed using mark-recapture methods. The first photograph of a particular whale is treated as the “mark”, and subsequent photographs of the same whale are “recaptures”. Both closed and open population models will be examined.

Monitor the seasonal trends of humpback whales in Prince William Sound relative to prey.

Although mark-recapture models provide an estimate of abundance, they do not describe seasonal trends. Consequently, we used the number of unique whales seen each month for establishing seasonal patterns and adjusted the pattern to account for the estimated number of whales present. The data used to establish the attendance patterns include calves and individuals identifiable in poor quality photographs and represent a lower bound to the daily attendance pattern for whales. Daily attendance was estimated by fitting linear models to the observed numbers.

Estimate inter-annual trends in humpback whale abundance.
Long term trends in abundance will be estimated by combining observations from this study and population estimates from Restoration Project: 100804, allowing us to explore the relationship between climate, prey availability, herring populations and humpback whales.

Determine the diet and dietary shifts of humpback whales.
When groups of whales are located and determined to be feeding, effort will made to determine what the whales were eating. Direct observations of prey being consumed, remains after feeding, and sonar mapping of the prey fields observed on a dual 50/200kHz frequency echosounder will be used to determine target prey of humpback whales. Prey distinctly visible on 50kHz was presumed to be fish. Prey visible only at 200kHz were presumed to be smaller and categorized as zooplankton. Confirmation of target prey will be accomplished using herring jigs, zooplankton tows, cast nets and skim nets (used to clean swimming pools) to collect surface fish near feeding whales. Scales and zooplankton were collected behind whales feeding at the surface with the skim net. Fecal samples are collected when possible. Certainty of identification of the target prey will be recorded as certain, probable or undetermined. Only cases were the identification was certain or probable were used to identify specific prey.

Estimate predation rates on herring by humpback whales.
The large size humpback whales prevent direct measurement of ingestion rates, therefore estimates of consumption are derived from the allometry between whale size and metabolic requirements. The model combines estimates of whale size, metabolic rates, abundance, and diet with estimates of the energy content of overwintering herring to predict consumption. We will estimated the potential biomass removed for each location and winter using four different modeling scenarios because of the uncertainty in whale metabolic costs and the numbers of whale present. The different scenarios represent the range of possible estimates. Dividing the total biomass consumed under a given scenario with estimates of herring abundance yields a measure of the intensity of humpback whale predation. This ratio, referred to here as predation intensity, is not meant to indicate the actual proportion of the biomass consumed by whales, but rather as an indicator of the scale of whale predation winter under each of the modeling scenarios.

Incorporate mortality rates into herring age structure models.

Information on whale abundance will then be fed into an age-structured model for Pacific herring in order to compare the relative magnitudes of disease, whales, and other factors on the mortality of herring. This will help EVOS TC better understand what factors are preventing the recovery of herring.

Project Logistics

For this project, John Moran (NOAA) will provide overall project management, logistics, photographic field captures, prey capture, and chemical analysis. Co-PI Jan Straley (UAS) will participate in photographic field captures, and lead the analysis of photographic IDs, , providing IDs and connection to photographic ID databases for all humpback whale photographs, quality assuring that permitting requirements are met, and collaborating with other whale researchers. Dr. Quinn (UAF) will lead the modeling efforts incorporating whale predation into the herring population models.

Humpback whale vessel survey schedule for Prince William Sound.

Month	**FY12**	**FY13**	**FY 14**	**FY15**	**FY16**
Oct	6 days	6 days	6 days	6 days	Synthesis
Dec	6 days	6 days	6 days	6 days	Synthesis
Feb	6 days	6 days	6 days	6 days	Synthesis
Total vessel days	**18**	**18**	**18**	**18**	**0**

C. Data Analysis and Statistical Methods

Data analysis is limited to estimating whale abundance and modeling their bioenergetic requirements. Whale abundance will be determined from photographic data. We anticipate that whales will not forage exclusively on a single prey item. The relative abundance of different prey types in their diet will be assumed to be equivalent to the relative abundance of species collected in our mid-water trawls. Trawls will be fished at the same depths whales are observed diving. The energetic content of a unit mass of prey in a particular patch will subsequently be estimated as the mean energy content of the prey in the patch, weighted by their relative abundance. Dividing this mass specific energy content into the energy requirement of a whale (described above) will provide an estimate of the total mass of the patch a whale requires. The contribution of herring to this total mass will be determined from their relative abundance in the sample and the average mass of an individual.

Modeling: Quinn et al. (2001) and Marty et al. (2003) developed an age-structured assessment model for Prince William Sound that included disease information. Thus the model can be used to evaluate the impact of disease on population abundance, recruitment, and survival. ADF&G uses this model in its annual assessments of herring (S. Moffitt, ADF&G, pers. comm.).

The model contains information about the fisheries on PWS herring, which include purse-seine, gillnet, and pound fisheries in the spring (mainly for roe), and a food and bait fishery in the summer and fall. The model provides an estimation framework to integrate the various sources of information about Pacific herring in Prince William Sound from 1980 – 2006, including age compositions from the purse-seine fishery and spawning surveys, egg production estimates, mile-days of milt from aerial surveys, and hydroacoustic biomass estimates Marty et al. 2003, Hulson et al. 2006, Marty et al. 2006). These observations are compared to comparable model quantities in a least squares setting to obtain parameter estimates of recruitment, natural mortality, abundance, and biomass.

We propose to use this model as the basis of comparing the relative magnitudes of the various factors affecting PWS herring dynamics. Recruitment estimates at age 3 will be related to auxiliary variables related to disease, the environment, spawning stock, and predation. It is a simple matter to use the model as a simulation framework, in which alternative harvest and recruitment scenarios are developed. An example of a question to be addressed would be: If whales did not eat herring, would the population have rebounded more so than what really occurred?

Specifically the model will be used: (1) to determine if predation on adult PWS herring is significantly contributing to its failure to recover, (2) to compare the magnitude of this effect to other known factors such as disease and low recruitment, (3) to investigate whether low recruitment is a function of predation.

D. Description of Study Area

Prince William Sound: Results from EVOSTC project PJ090804 have identified humpback whale feeding aggregations whales in Sawmill Bay, Montague Strait, Elrington Passage, Prince of Wales Passage, and Port Gravina. Focusing on the waters of Sawmill Bay, where local researchers can be land based with small boats will continue to provide fine-scale temporal data, however to assess the impact of whales on herring, year three, will use larger vessels to survey all of PWS.

E. Coordination and Collaboration with Other Efforts

This project will combine the skills and location advantage of researchers from Auke Bay Lab (Rice, Heintz, Moran), Univ of Alaska Southeast (Straley), Univ. of Alaska Fairbanks (Quinn). We will coordinate with the other PI's in the EVOS TC Long- term monitoring and herring projects.

III. SCHEDULE

A. Project Milestones

Objectives

1) Population estimates of humpback whales through the use of photographic mark-recapture models. *To be met September 2015.*

2) Monitor the seasonal trends of humpback whales in Prince William Sound relative to prey. *To be met September 2015.*

3) Estimate inter-annual trends in humpback whale abundance. *To be met September 2015.*

4) Determine the diet and dietary shifts of humpback whales. *To be met September 2015.*

5) Estimate predation rates on herring by humpback whales. *To be met December 2015.*

6) Incorporate mortality rates into herring age structure models. *To be met January 2016.*

B. Measurable Project Tasks

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)
October: *6 day survey of PWS*
December: *6 day survey of PWS*

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)
January: *Annual Marine science Symposium*
February: *6 day survey of PWS*

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)
Opportunistic surveys, analyze winter data.

FFY 12, 4th quarter (July 1, 2012-September 30, 2012)

Opportunistic surveys, analyze winter data.

FFY 13, 1st quarter (October 1, 2012-December 31, 2012)
October: *6 day survey of PWS*
December: *6 day survey of PWS*

FFY 13, 2nd quarter (January 1, 2013-March 31, 2013)
January: *Annual Marine science Symposium*
February: *6 day survey of PWS*

FFY 13, 3rd quarter (April 1, 2013-June 30, 2013)
Opportunistic surveys, analyze winter data.

FFY 13, 4th quarter (July 1, 2013-September 30, 2013)
Opportunistic surveys, analyze winter data.

FFY 14, 1st quarter (October 1, 2013-December 31, 2013)
October: *6 day survey of PWS*
December: *6 day survey of PWS*

FFY 14, 2nd quarter (January 1, 2014-March 31, 2014)
January: *Annual Marine science Symposium*
February: *6 day survey of PWS*

FFY 14, 3rd quarter (April 1, 2014-June 30, 2014)
Opportunistic surveys, analyze winter data.

FFY 14, 4th quarter (July 1, 2014-September 30, 2014)
Opportunistic surveys, analyze winter data.

FFY 15, 1st quarter (October 1, 2014-December 31, 2014)
October: *6 day survey of PWS*
December: *6 day survey of PWS*

FFY 15, 2nd quarter (January 1, 2015-March 31, 2015)
January: *Annual Marine science Symposium*
February: *6 day survey of PWS*

FFY 15, 3rd quarter (April 1, 2015-June 30, 2015)
Compile and analyze data.

FFY 15, 4th quarter (July 1, 2015-September 30, 2015)
Compile and analyze data.

FFY 16, 1st quarter (October 1, 2015-December 31, 2015)
Compile and analyze data. Begin writing final report.

FFY 15, 2nd quarter (January 1, 2015-March 31, 2015)
January: *Annual Marine science Symposium.*
Complete final report

FFY 16, 3rd quarter (April 1, 2016-June 30, 2016)
April 15 *Submit final report. This will consist of a draft manuscript for publication to the Trustee Council Office.*

Long-term Monitoring: Pelagic Monitoring Component - Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound

Auke Bay Lab Budget Budget Justification - $ 526K

Personnel Salaries ($8K) – Overtime for Moran

Travel ($23,400) - Five round trips to the EVOS annual meetings. 24 round trips Juneau to Cordova for field work.

Contractual/Sample Analysis ($485.6K) - Includes 72 large vessel days in PWS, soft labor to collect and process samples, Contracts for UAS (Straley) and UAF (Quinn). Contract to conduct opportunistic whale surveys in PWS.

Commodities ($26K) - To prepare samples for shipping, freight, and miscellaneous supplies.

Equipment ($0) - No new equipment will be purchased with EVOSTC funds.

Break down of UAS Budget - $ 209,787

Personnel Salaries ($178,542**) -** Funds are requested for 6.6 months of salary for PI Jan Straley (this will include field research, travel (meetings, presentations and training), administration, analysis, and report/paper writing) and 12.3 months of salary for Ms. Cedarleaf and 8 months for a yet-to-be-named undergraduate student. Ms. Straley will coordinate the third year of data collection of humpback whale photo identification data in Lynn Canal and Prince William Sound, (including Chenega/Sawmill Bay) and the second full year of field work for Sitka Sound. Ms. Straley will conduct humpback photo identification surveys twice monthly and assist project staff with hydroacoustic prey assessment surveys in Sitka Sound during the fall and winter. Ms. Straley will conduct the photo identification work in the areas of Prince William Sound outside of Chenega/Sawmill Bay in conjunction with the monthly hydroacoustic surveys. She will continue to work with the data analyst, T. Quinn, in preparing the data for quantitative analysis. She will be responsible for grant administration, oversight of the humpback whale data and final report preparation that will describe numbers, movements, distribution, and residency times of individual humpback whales in the study areas. J. Cedarleaf, research assistant, will conduct the photographic matching to various catalogs (collections of fluke photographs) in the North Pacific, manage the database (data entry and organization) and oversee photographic quality.

Benefits ($0) - Benefits are included in the associated hourly rates.

Equipment - No funds are requested for Equipment.

Travel ($) – *Domestic*: No funds are requested for Domestic Travel.
Foreign: No funds are requested for Foreign Travel.

Other/Consultants/Services ($0) – No funds are requested for Other/Consultants/Services.

Supplies ($0) – No funds are requested for Supplies.

Facilities and Administration (F&A) Costs ($31,245) - Facilities and Administrative (F&A) Costs are calculated at 17.5% of the Modified Total Direct Costs (MTDC).

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$2.0	$2.0	$2.0	$2.0	$0.0	$8.0
Travel	$5.4	$5.4	$5.4	$5.4	$1.8	$23.4
Contractual	$103.5	$104.8	$114.7	$116.5	$46.1	$485.6
Commodities	$6.0	$6.0	$6.0	$6.0	$2.0	$26.0
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$116.9	$118.2	$128.1	$129.9	$49.9	$543.0
General Administration (9% of subtotal)	$10.5	$10.6	$11.5	$11.7	$4.5	$48.9
PROJECT TOTAL	$127.4	$128.8	$139.6	$141.6	$54.4	$591.9
Other Resources (Cost Share Funds)	$25.0	$25.0	$25.0	$25.0	$25.0	$125.0

COMMENTS: In-kind contribution from NOAA - Three month salary/year for Moran.

FY12-16

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley

SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$2.0	$2.0	$2.0	$2.0	$0.0	$8.0
Travel	$5.4	$5.4	$5.4	$5.4	$1.8	$23.4
Contractual	$103.5	$104.8	$114.7	$116.5	$46.1	$485.6
Commodities	$6.0	$6.0	$6.0	$6.0	$2.0	$26.0
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$116.9	$118.2	$128.1	$129.9	$49.9	$543.0
General Administration (9% of subtotal)	$10.5	$10.6	$11.5	$11.7	$4.5	$48.9
PROJECT TOTAL	$127.4	$128.8	$139.6	$141.6	$54.4	$591.9
Other Resources (Cost Share Funds)	$25.0	$25.0	$25.0	$25.0	$25.0	$125.0

COMMENTS: In-kind contribution from NOAA - Three month salary/year for Moran.

FY12-16

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4A
TRUSTEE AGENCY SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Moran	Humpback Whale Monitoring			2.0	2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	2.0	
				Personnel Total	$2.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
JNU-CDV	0.6	6	12	0.0	3.6
Jnu ANC AMSS	0.6	1	4	0.3	1.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.4

FY12

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Straley (UAS)	41.5
Vessel Charters	28.0
Chemistry lab analysis contract labor- ABL	14.0
Opportunistic Surveys	10.0
Contract labor	10.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$104

Commodities Costs: Description	Commodities Sum
Shipping	3.0
Field Supplies	3.0
Commodities Total	$6.0

FY12

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Moran	Humpback Whale Monitoring			2.0	2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	2.0	
				Personnel Total	$2.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
JNU-CDV	0.6	6	12	0.0	3.6
JNU-ANC AMSS	0.6	1	4	0.3	1.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.4

FY13

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Straley (UAS)	42.8
Vessel Charters	28.0
Chemistry lab analysis contract labor- ABL	14.0
Opportunistic Surveys	10.0
Contract labor	10.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$105

Commodities Costs: Description	Commodities Sum
Shipping	3.0
Field Supplies	3.0
Commodities Total	$6.0

FY13

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Moran	Humpback Whale Monitoring			2.0	2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	2.0	
				Personnel Total	$2.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
JNU-CDV	0.6	6	12	0.0	3.6
Jnu ANC AMSS	0.6	1	4	0.3	1.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.4

FY14

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Straley (UAS)	52.7
Vessel Charters	28.0
Chemistry lab analysis contract labor- ABL	14.0
Opportunistic Surveys	10.0
Contract labor	10.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$115

Commodities Costs: Description	Commodities Sum
Shipping	3.0
Field Supplies	3.0
Commodities Total	$6.0

FY14

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Moran	Humpback Whale Monitoring			2.0	2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	2.0	
				Personnel Total	$2.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
JNU-CDV	0.6	6	12	0.0	3.6
Jnu ANC AMSS	0.6	1	4	0.3	1.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.4

FY15

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
PERSONNEL &
TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Straley (UAS)	54.5
Vessel Charters	28.0
Chemistry lab analysis contract labor- ABL	14.0
Opportunistic Surveys	10.0
Contract labor	10.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$117

Commodities Costs: Description	Commodities Sum
Shipping	3.0
Field Supplies	3.0
Commodities Total	$6.0

FY15

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Jnu ANC AMSS	0.6	1	4	0.3	1.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.8

FY16

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
PERSONNEL &
TRAVEL DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Straley (UAS)	18.4
Quinn (UAF)	20.0
Contract labor	7.7
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$46

Commodities Costs: Description	Commodities Sum
Shipping	2.0
Commodities Total	$2.0

FY16

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
EQUIPMENT DETAIL

PROJECT TITLE: Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound

DEPT #:

PI: Jan Straley

START: 01 October 2011

BANNER #:

END: 30 September 2016

Be sure to select the appropriate F&A rate on line 130.

Version 09/10/2010

						Year 1		Year 2		Year 3		Year 4		Year 5		Total Project
SALARIES AND WAGES						**Hours**		**Hours**		**Hours**		**Hours**		**Hours**		
Senior Personnel			**Hourly Wage**	**Leave Rate**	**Yearly Increase**											
Total Number of Hours	Employee Name															
1142.00	Jan Straley	A9 - Faculty (ACCFT)	$37.87	1.4%	1.045	174.0	$6,682	174.0	$6,982	300.0	$12,580	300.0	$13,147	194.0	$8,884	**$48,275**
		Total Senior Personnel					$6,682		$6,983		$12,581		$13,147		$8,885	$48,276
Other Personnel																
Total Number of Hours																
2155.90	Jen Cedarleaf, Research Technician 4	NR - Classified Staff	$21.87	21.4%	1.03	522.0	$13,857	522.0	$14,273	522.0	$14,701	522.0	$15,142	67.9	$2,029	**$60,002**
Student Employees																
Number of Students																
1	to be named	ST - Undergrad, summer	$10.50	0.0%	1	348.0	$3,654	348.0	$3,654	348.0	$3,654	348.0	$3,654	0.0	$0	**$14,616**
		Total Other Personnel					$17,512		$17,927		$18,356		$18,797		$2,029	$74,619
TOTAL SALARIES AND WAGES							**$24,194**		**$24,910**		**$30,937**		**$31,944**		**$10,914**	**$122,895**
FRINGE BENEFITS																
Senior Personnel	Jan Straley	A9 - Faculty (ACCFT)		39.5%			$2,639		$2,758		$4,969		$5,193		$3,509	**$19,069**
		Total Senior Personnel					$2,639		$2,758		$4,969		$5,193		$3,509	**$19,069**
Other Personnel																
	Jen Cedarleaf, Research Technician 4	NR - Classified Staff		58.9%			$8,162		$8,407		$8,659		$8,919		$1,195	**$35,341**
Student Employees																
	to be named	ST - Undergrad, summer		8.4%			$307		$307		$307		$307		$0	**$1,228**
		Total Other Personnel					$8,469		$8,714		$8,966		$9,226		$1,195	**$36,569**
TOTAL FRINGE BENEFITS							**$11,109**		**$11,472**		**$13,936**		**$14,419**		**$4,705**	**$55,638**
TOTAL SALARIES AND BENEFITS							**$35,303**		**$36,382**		**$44,873**		**$46,363**		**$15,619**	**$178,533**
A. MTDC (total costs subject to F&A)							**$35,303**		**$36,382**		**$44,873**		**$46,363**		**$15,619**	**$178,533**
B. Facilities and Administration (F&A)		**Enter other rates manually**			17.5%		**$6,178**		**$6,367**		**$7,853**		**$8,114**		**$2,733**	**$31,243**
D. Total Direct Costs (A+C)							**$35,303**		**$36,382**		**$44,873**		**$46,363**		**$15,619**	**$178,533**
E. Total Sponsor Request (B+D)							**$41,481**		**$42,749**		**$52,726**		**$54,477**		**$18,352**	**$209,776**

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term monitoring: Pelagic monitoring component - Monitoring long-term changes in forage fish distribution, abundance, and body condition in Prince William Sound.

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): John Piatt and Mayumi Arimitsu, U.S. Geological Survey, Alaska Science Center

Study Location: Prince William Sound

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al.

In response to a lack of recovery of wildlife populations following the *Exxon Valdez* Oil Spill (EVOS), and evidence of natural background changes in forage fish abundance, there was a significant effort to document forage fish distribution, abundance, and variability in Prince William Sound (PWS) in the 1990's. We propose to adopt some of these earlier sampling schemes and protocols to continue monitoring forage fish in Prince William Sound with fishing and acoustic surveys of forage fish, and to measure indices of forage fish condition and foraging success.

Estimated Budget:
EVOSTC Funding Requested:
FY2012- $209.9K, FY2013-$202.5K, FY2014-202.5K, FY2015-$202.5K, FY2016-$150.3K

Non-EVOSTC Funds to be used: (USGS Matching Funds)
FY2012- $297.2K, FY2013-$297.2K, FY2014-297.2K, FY2015-$297.2K, FY2016-$72.2K

Date: May 22, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Identify the problem the project is designed to address. Describe the background and history of the problem. Include a scientific literature review that covers the most significant previous work history related to the project.

Problem Statement: Fluctuations in forage fish abundance can have dramatic ecosystem effects because much of the energy transferred from lower to higher trophic levels passes through a small number of key forage species. Forage fish typically produce a large number of offspring and have short lifespans, and these traits predispose populations towards large fluctuations in abundance, with associated impacts on predators. In response to a lack of recovery of wildlife populations following the *Exxon Valdez* Oil Spill (EVOS), and evidence of natural background changes in forage fish abundance, there was a significant effort to document forage fish distribution, abundance, and variability in Prince William Sound (PWS) in the 1990's. Since then, ongoing research has focused on commercially valuable Pacific herring, whereas less has been done to monitor other ecologically important forage species such as Pacific sand lance, capelin, eulachon and euphausiids (which we include under the generic term "forage species"). The lack of time series data on abundance and distribution of these forage species in PWS, and the spatial and temporal variability inherent to these populations makes it difficult to assess population status and trends of most forage species. We propose to initiate a program to monitor: 1) forage fish abundance and community composition; by conducting fishing and acoustic surveys of abundance and distribution that are cost effective and allow for long-term trend analyses; and, 2) indices of forage fish biology that are important in maintaining predator health, such as forage fish body size, condition, proximate composition and diet (inferred from stable isotope ratios).

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

List the objectives of the proposed research, the hypotheses being tested during the project, and briefly state why the intended research is important.

Project Concept: We propose to gather new data on the distribution, relative abundance, and body condition of forage fish species in PWS, compare these data with some historical data from the 1990's and provide a baseline for future assessment of population trends. The specific objectives of this study are to:

1) Identify robust indices for monitoring forage fish populations over time and devise a sampling strategy for long term monitoring of those indices.
2) After completing Objective 1, and in addition to any other indices we might identify, assess the current distribution, abundance, species composition, and body condition of forage fishes (other than herring) in selected areas of PWS and at selected times of year.
3) Relate abundance and distribution of forage species to abiotic and biotic characteristics of the marine environment.

During the initial planning phase, we will consider how to replicate some of the APEX forage fish work (see below) previously supported (~650 K annually) in PWS by the EVOSTC in order to obtain useful trend information on fish abundance. We will determine the most appropriate sample design by examining historical data and consulting with other PI's (e.g., Rice, Brown, Thedinga, Haldorson, Coyle, Ostrand) on past and current projects. Options might include intensive sampling of one or two subareas within PWS every year, random sampling of the entire Sound each year, intensive sampling of different sites within PWS each year, or sampling different areas of the Gulf of Alaska in sequential years (e.g., PWS, Kenai Fjords, Kachemak Bay, Lower Cook Inlet). Because biomass may fluctuate considerably at small to large spatial and temporal scales, other useful indices of population change may be obtained from studies over time, such as: species composition within trawl and seine catches, proximate composition of fish, and other measures of body condition (length-weight relationship, age structure, etc.) or feeding conditions (stable isotope composition).

To achieve our second and third objectives, we will conduct hydroacoustic-trawl surveys using a random-stratified sample design that includes extensive environmental sampling at each station. The design will include elements of forage fish studies we conducted in lower Cook Inlet with EVOSTC funding in 1996-2000, forage fish studies in Glacier Bay and Kenai Fjords national parks in 1999-2008, and a survey we recently completed in Harriman and College fjords in July 2010 in collaboration with USFWS (D. Irons). We will simultaneously measure marine predators, forage fish assemblages and marine habitat by overlaying a 2.5 km^2 grid over navigable waters in PWS. Cells to be sampled will be selected at random after stratifying by habitat type (e.g., glacial, nearshore, offshore). At each station, we will sample a transect equal to the length of the cell by: 1) surveying for marine birds and mammals, 2) collecting hydroacoustic data, 3) sampling sea surface temperature and salinity, and, 4) sampling fish with a modified herring trawl. At a station on each transect we will conduct a vertical plankton tow, obtain an oceanographic profile of the water column, and collect water samples for nutrients and chlorophyll *a* analyses. Forage fish inhabiting shallow nearshore waters will also be sampled with a beach seine on appropriate nearshore sites (e.g., suitable beach substrate, historical sample site, proximity to benthic studies sample site). A suite of parameters will be measured at each station including: bird density, mammal density, hydroacoustic fish biomass, fish CPUE, fish species composition, zooplankton biomass and species composition, phytoplankton abundance, nutrient concentration, hydrographic properties of the water column (temperature, salinity, beam transmittance, fluorescence, dissolved oxygen, light), bathymetry (depth, slope), and geographic topography (distance to glaciers, marine sills, streams, etc).

B. Procedural and Scientific Methods

For each objective listed in A. above, identify the specific methods that will be used to meet the objective. In describing the methodologies for collection and analysis, identify measurements to be made and the anticipated precision and accuracy of each measurement and describe the sampling equipment in a manner that permits an assessment of the anticipated raw-data quality.

If applicable, discuss alternative methodologies considered, and explain why the proposed methods were chosen. In addition, projects that will involve the lethal collection of birds or mammals must comply with the Trustee Council's policy on collections, available at www.evostc.state.ak.us/Proposals/policies.htm.

Major logistics: We will conduct this research from the USGS R/V *Alaskan Gyre*, a 16 m vessel equipped with a midwater trawl designed specifically for forage fish work (the same net used in APEX surveys of PWS and Cook Inlet in the 1990s). Twenty-day cruises will coincide with the peak in forage fish abundance and timing of previous work (July-August) for four years, and a funding for a fifth year will go towards analysis, reporting, and preparation of manuscripts. Based on experiences elsewhere, we expect that the total of 20 ship days will allow us to trawl and sample about 70 stations, conduct beach seines on ca. 15-20 beaches, collect ancillary environmental data and allow for vessel travel time to PWS, travel between sites, and occasional weather days.

C. Data Analysis and Statistical Methods

Describe the process for analyzing data. Discuss the means by which the measurements to be taken could be compared with historical observations or with regions that are thought to have similar ecosystems. Describe the statistical power of the proposed sampling program for detecting a significant change in numbers. To the extent that the variation to be expected in the response variable(s) is known or can be approximated, proposals should demonstrate that the sample sizes and sampling times (for dynamic processes) are of sufficient power or robustness to adequately test the hypotheses. For environmental measurements, what is the measurement error associated with the devices and approaches to be used?

Based on our work in College and Harriman Fjord in 2010, and historical studies, we expect to obtain numerous samples of important forage species including capelin, eulachon, sand lance, herring, and euphausiids, etc., which can then be analyzed in the laboratory to assess body condition, proximate composition, and stable isotope composition using standard laboratory methods (contracted work). The simultaneous collection of a suite of some 25+ ecosystem variables during each trawl will allow us to model fish and predator community structure relative to important habitat features. Assessing body condition and habitat use is an important component of the monitoring program, because it allows us to lay the groundwork for understanding factors that may be responsible for future changes in abundance or health of various forage species.

We will employ a variety of statistical approaches to examine overall patterns in distribution of fish or apex predators and correlate these patterns with bio-physical features. For example, we will: 1) Use Principal Components Analysis (PCA) to identify important gradients in physical parameters within PWS; 2) Assess the relative contributions of different biophysical features in predicting the relative abundance of key forage fish and apex predators using General Linear

Models (GLM) or Classification and Regression Trees (CART); 3) Use Detrended Correspondence Analysis (DCA) or Non-metric multidimensional scaling (NMDS) to characterize community structure and patterns of community response to physical gradients; 4) Identify important hotspots in distribution of forage fish and use statistical indices (e.g., Moran's I, Getis-Ord Gi* and Ripley's K distance) to determine the spatial scale at which oceanographic features and biological communities are clustered; 5) Identify appropriate spatial scales and use these for all subsequent analyses of data. Spatial data will be analyzed using tools available in R (The R Foundation for Statistical Computing v. 2.7.2, Vienna, Austria) and ArcGIS (ESRI v. 9.2, Redlands, CA). l. 1997.

D. Description of Study Area

Where will the project be undertaken? Describe the study area, including if applicable decimally-coded latitude and longitude readings of sampling locations or the bounding coordinates of the sampling region (e.g., 60.8233, -147.1029, 60.4739, -147.7309 for the north, east, south and west bounding coordinates). The formula for converting from degree minute seconds to decimal degrees is: degrees + (minutes/60) + (seconds/3600) so 121°8'6" = 121. + (8/60) + (6/3600) = 121.135

We will work primarily within Prince William Sound (bounding coordinates: 61.292, -148.74; 61.168, -146.057; 60.273, -145.677; 59.662, -148.238), although some work may be conducted in nearby Gulf of Alaska systems such as Kenai Fjords, Lower Cook Inlet, and Kachemak Bay (bounding coordinates: 59.653, -154.14; 60.168, -149.315; 59.78, -149.169; 58.585, -153.45).

E. Coordination and Collaboration with Other Efforts

Indicate how your proposed project relates to, complements or includes collaborative efforts with other proposed or existing projects funded by the Trustee Council. Describe any coordination that has taken or will take place (with other Council funded projects, ongoing agency operations, activities funded by other marine research entities, etc.) and what form the coordination will take (shared field sites, research platforms, sample collection, data management, equipment purchases, etc.). If the proposed project requires or includes collaboration with other agencies, organizations or scientists to accomplish the work, such arrangements should be fully explained and the names of agency or organization representatives involved in the project should be provided. If your proposal is in conflict with another project, note this and explain why.

We will make use of current and previous forage fish work in PWS— including that of ongoing herring assessments, the Sound Ecosystem Assessment (SEA) program, and the forage fish component of the Alaska Predator Ecosystem Experiment in PWS (APEX)— to help design our sampling and monitoring plan, and to make meaningful comparisons with past and current findings. We will also seek out and incorporate unpublished information for non-target species (e.g., eulachon, capelin) in bycatch data from NOAA RACE surveys, and work conducted at the Prince William Sound Science Center (e.g., Thorne *et al*., Bishop *et al*.), and University of Alaska (e.g. Iverson *et al*., Brown *et al*. currently Flying Fish Ltd., Norcross *et al*.), and ADF&G (Moffitt *et al*., Byerly *et al*.). We will coordinate our efforts with those of other PIs studying pelagic and nearshore components of the Sound, particularly those working on the current

Herring Assessment (project 10100132, PI: Scott Pegau, PWSSC) and provide them with data we collect that may be useful in their analyses. All oceanographic data will be archived with AOOS. Herring and other requested samples will be made available to PIs involved in dedicated herring studies, and samples of other forage species will be saved and could be distributed opportunistically to PIs engaged in trophic studies using stable isotopes, fatty acids, etc.

III. SCHEDULE

A. Project Milestones

For each project objective listed above (II.A.), specify when critical project tasks will be completed. Project reviewers will use this information in conjunction with annual project reports to assess whether projects are meeting their objectives and are suitable for continued funding.

Objective 1. Identify robust indices for monitoring forage fish populations over time and devise a sampling strategy for long term monitoring of those indices.

To be met by March 2012

Objective 2. After completing Objective 1, and in addition to any other indices we might identify, assess the current distribution, abundance, species composition, and body condition of forage fishes (other than herring) in selected areas of PWS and at selected times of year.

To be met by September 2016

Objective 3. Relate abundance and distribution of forage species to abiotic and biotic characteristics of the marine environment.

To be met by September 2016

B. Measurable Project Tasks

Specify, by each quarter of each fiscal year, when critical project tasks (for example, sample collection, data analysis, manuscript submittal, etc.) will be completed. This information will be the basis for the quarterly project progress reports that are submitted to the Trustee Council Office. Please format your schedule like the following example.

FFY 11, 4th quarter (July 1, 2011-September 30, 2011)

September: *Project funding approved by Trustee Coucil*

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)

Oct.- Dec *Coordinate with collaborators,*
Begin acquisition of current and historical data

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)

Jan. – Mar. *Continue planning, historical data aquisition*

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)

April 15 *Submit annual progress report.*

Apr. – Jun.	*Prepare for cruise, hire seasonal staff, buy supplies,*

FFY 12, 4th quarter (July 1, 2011-September 30, 2012)

July:	*Conduct cruise, collect fish and ancillary data*
August:	*Post cruise data organization, specimen disposition*

FFY 13, 1st quarter (October 1, 2012-December 31, 2012)

Oct. – Dec.	*Data organization, archival, analysis*
December 15:	*Provide data to EVOSTC archive*

FFY 13, 2nd quarter (January 1, 2013-March 31, 2013)

January 18:	*Annual Marine Science Symposium*
Jan. – Mar.	*Data analysis and writing*

FFY 13, 3rd quarter (April 1, 2013-June 30, 2013)

April 15	*Submit annual progress report.*
Apr. – Jun.	*Prepare for cruise, hire seasonal staff, buy supplies*

FFY 13, 4th quarter (July 1, 2013-September 30, 2013)

July:	*Conduct cruise, collect fish and ancillary data*
August:	*Post cruise data organization, specimen disposition*

FFY 14, 1st quarter (October 1, 2013-December 31, 2013)

Oct. – Dec.	*Data organization, archival, analysis*
December 15:	*Provide data to EVOSTC archive*

FFY 14, 2nd quarter (January 1, 2014-March 31, 2014)

January 18.	*Annual Marine Science Symposium*
Jan. – Mar.	*Data analysis and writing*

FFY 14, 3rd quarter (April 1, 2014-June 30, 2014)

April 15	*Submit annual progress report.*
Apr. – Jun.	*Prepare for cruise, hire seasonal staff, buy supplies*

FFY 14, 4th quarter (July 1, 2014-September 30, 2014)

July:	*Conduct cruise, collect fish and ancillary data*
August:	*Post cruise data organization, specimen disposition*

FFY 15, 1st quarter (October 1, 2014-December 31, 2014)

Oct. – Dec.	*Data organization, archival, analysis*
December 15:	*Provide data to EVOSTC archive*

FFY 15, 2nd quarter (January 1, 2015-March 31, 2015)

January 18.	*Annual Marine Science Symposium*
Jan. – Mar.	*Data analysis and writing*

FFY 15, 3rd quarter (April 1, 2015-June 30, 2015)

April 15	*Submit annual progress report.*
Apr. – Jun.	*Prepare for cruise, hire seasonal staff, buy supplies*

FFY 15, 4th quarter (July 1, 2015-September 30, 2015)

July:	*Conduct cruise, collect fish and ancillary data*
August:	*Post cruise data organization, specimen disposition*

FFY 16, 1st quarter (October 1, 2015-December 31, 2015)

Oct. – Dec.	*Data organization, archival, analysis*
December 15:	*Provide data to EVOSTC archive*

FFY 16, 2nd quarter (January 1, 2016-March 31, 2016)

January 18.	*Annual Marine Science Symposium*
Jan. – Mar.	*Data analysis and writing*

FFY 16, 3rd quarter (April 1, 2016-June 30, 2016)

April 15	*Submit final progress report.*
Apr. – Jun.	*Data analysis and writing*

FFY 16, 4th quarter (July 1, 2016-September 30, 2016)

Jul.-Sep.	*Data analysis and writing*
August 15	*Submit draft final report (in form of manuscript for publication)*
September 30	*Submit final report, end project.*

Budget: Funding required to complete this research is outlined in the accompanying excel file. USGS will make a substantial contribution of personnel time for PIs (0.5 FTE GS-11, 0.2 FTE GS-15), half of the vessel costs for annual cruises, and all the field equipment required including sampling nets (beach seine, modified herring trawl, zooplankton nets), oceanography equipment (CTD with rosette and external sensors, thermosalinograph), BIOSONICS DTX-4000 digital hydroacoustic equipment, and small boats. We request funding for 1FTE at the GS-9 level, 0.6 FTE at the GS-7 level, and 0.4 FTE at the GS-5 level. Travel funds will cover the field trips and meetings for the PI and other personnel. We will split the vessel costs equally between USGS and EVOS funding for cruises each year. Equipment and supplies will include an EchoView software license for acoustic data processing (year 1), and also calibration and maintenance for oceanographic equipment (all years). External contracts will include zooplankton processing, nutrients and chlorophyll a analyses, and stable isotope analyses. Indirect costs include 9% overhead.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$123.1	$123.1	$123.1	$123.1	$119.8	$612.2
Travel	$11.4	$10.5	$10.5	$10.5	$3.3	$46.2
Contractual	$14.6	$28.9	$28.9	$28.9	$14.8	$115.9
Commodities	$20.0	$20.0	$20.0	$20.0	$0.0	$80.0
Equipment	$23.5	$3.3	$3.3	$3.3	$0.0	$33.4
Indirect Costs (*will vary by proposer*)						
SUBTOTAL	$192.6	$185.7	$185.7	$185.7	$137.9	$887.7
General Administration (9% of subtotal)	$17.3	$16.7	$16.7	$16.7	$12.4	$79.9
PROJECT TOTAL	$209.9	$202.5	$202.5	$202.5	$150.3	$967.6
Other Resources (Cost Share Funds)	$297.2	$297.2	$297.2	$297.2	$72.2	$1,260.8

Over life of the project, USGS will make a substantial contribution of salary (360.8K) for PIs (0.5 FTE GS-11, 0.2 FTE GS-15), half of the vessel costs for annual cruises (80K), and in each year all the field equipment required including sampling nets (5K; beach seine, modified herring trawl, zooplankton nets), oceanography equipment (90K; CTD with rosette and external sensors, thermosalinograph), BIOSONICS DTX-4000 digital hydroacoustic equipment (104K), and small boats (10.5K).

FY12-16

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$123.1	$123.1	$123.1	$123.1	$119.8	$612.2
Travel	$11.4	$10.5	$10.5	$10.5	$3.3	$46.2
Contractual	$14.6	$28.9	$28.9	$28.9	$14.8	$115.9
Commodities	$20.0	$20.0	$20.0	$20.0	$0.0	$80.0
Equipment	$23.5	$3.3	$3.3	$3.3	$0.0	$33.4
SUBTOTAL	$192.6	$185.7	$185.7	$185.7	$137.9	$887.7
General Administration (9% of subtotal)	$17.3	$16.7	$16.7	$16.7	$12.4	$79.9
PROJECT TOTAL	$209.9	$202.5	$202.5	$202.5	$150.3	$967.6
Other Resources (Cost Share Funds)	$297.2	$297.2	$297.2	$297.2	$72.2	$1,260.8

Over life of the project, USGS will make a substantial contribution of salary (360.8K) for PIs (0.5 FTE GS-11, 0.2 FTE GS-15), half of the vessel costs for annual cruises (80K), and in each year all the field equipment required including sampling nets (5K; beach seine, modified herring trawl, zooplankton nets), oceanography equipment (90K; CTD with rosette and external sensors, thermosalinograph), BIOSONICS DTX-4000 digital hydroacoustic equipment (104K), and small boats (10.5K).

FY12-16

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4A
TRUSTEE AGENCY SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Piatt GS-15 (in kind)	LTM Forage Fish Project/Team Leader	2.0	0.0		0.0
Arimitsu GS-12 (in kind)	LTM Forage Fish Project/Project Leader	6.0	0.0		0.0
GS-9	LTM Forage Fish Project/ Fisheries Biologist	12.0	6057.0		72.7
GS-7	LTM Forage Fish Project/ Fisheries Biologist	8.0	4286.0		34.3
GS-5	LTM Forage Fish Project/ Seasonal Tech	5.0	3225.0		16.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	13568.0	0.0	
				Personnel Total	$123.1

Travel Costs:		Ticket	Round	Total	Daily	Travel
Description		Price	Trips	Days	Per Diem	Sum
PI-Field Site	Airfare, M&IE	1,184	1	40	20.0	2.0
PI-Meeting	Airfare, hotel, M$IE	1,077	1	5	175.0	2.0
CO-PI Field Site	Airfare, M&IE	1,158	1	40	20.0	2.0
CO-PI Meeting	Airfare, hotel, M$IE	477	1	5	175.0	1.4
GS 9 Field Site	Airfare, M&IE	450	2	25	20.0	1.4
GS 7 Field Site	Airfare, M&IE	450	2	25	20.0	1.4
Volunteer Field Site	Airfare, M&IE	850	1	25	20.0	1.4
						0.0
						0.0
						0.0
						0.0
					Travel Total	$11.4

FY12

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Zooplankton (60*$185/sample)	11.1
Nutrients, chla (120*$25/sample)	3.0
Outreach	0.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$14.6

Commodities Costs: Description	Commodities Sum
Research Vessel Operations (including fuel, food, supplies)	20
Commodities Total	$20.0

FY12

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
EchoView Data Processing Software			16.8
Manifold for POM/phyto filters			0.8
2 computers			3.6
Calibration of CTD/sensors			1.8
Other Sampling equipment			0.5
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$23.5

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Research Vessel M/V Gyre (with mid-water trawl capability)	1	USGS
Nets (beach seine, trawl, zooplankton)	5	USGS
Oceanographic equipment (CTD, Rossette, Thermosalinograph)	1	USGS
BIOSONICS DT-4000 Hydroacoustic system	2	USGS
Small boats (Naiad RIB, Zodiac)	2	USGS

FY12

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Piatt GS-15 (in kind)	LTM Forage Fish Project/Team Leader	2.0	0.0		0.0
Arimitsu GS-12 (in kind)	LTM Forage Fish Project/Project Leader	6.0	0.0		0.0
GS-9	LTM Forage Fish Project/ Fisheries Biologist	12.0	6057.0		72.7
GS-7	LTM Forage Fish Project/ Fisheries Biologist	8.0	4286.0		34.3
GS-5	LTM Forage Fish Project/ Seasonal Tech	5.0	3225.0		16.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	13568.0	0.0	
				Personnel Total	$123.1

Travel Costs:		Ticket	Round	Total	Daily	Travel
Description		Price	Trips	Days	Per Diem	Sum
PI-Field Site	Airfare, M&IE	1,184	1	40	20.0	2.0
PI-Meeting	Airfare, hotel, M$IE	1,077	1	5	175.0	2.0
CO-PI Field Site	Airfare, M&IE	1,158	1	40	20.0	2.0
CO-PI Meeting	Airfare, hotel, M$IE	477	1	5	175.0	1.4
GS 9 Field Site	Airfare, M&IE	450	1	25	20.0	1.0
GS 7 Field Site	Airfare, M&IE	450	1	25	20.0	1.0
Volunteer Field Site	Airfare, M&IE	850	1	25	20.0	1.4
						0.0
						0.0
						0.0
						0.0
					Travel Total	$10.5

FY13

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Zooplankton (60*$185/sample)	11.1
Nutrients, chla (120*$25/sample)	3.0
Stable isotope analyses	14.3
Outreach	0.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$28.9

Commodities Costs: Description	Commodities Sum
Research Vessel Operations (including fuel, food, supplies)	20
Commodities Total	$20.0

FY13

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**

DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Calibration of CTD/sensors			1.80
EchoView Data license renewal (x2)			1.00
Other Sampling equipment			0.50
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$3.3

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Research Vessel M/V Gyre (with mid-water trawl capability)	1	USGS
Nets (beach seine, trawl, zooplankton)	5	USGS
Oceanographic equipment (CTD, Rossette, Thermosalinograph)	1	USGS
BIOSONICS DT-4000 Hydroacoustic system	2	USGS
Small boats (Naiad RIB, Zodiac)	2	USGS

FY13

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Piatt GS-15 (in kind)	LTM Forage Fish Project/Team Leader	2.0	0.0		0.0
Arimitsu GS-12 (in kind)	LTM Forage Fish Project/Project Leader	6.0	0.0		0.0
GS-9	LTM Forage Fish Project/ Fisheries Biologist	12.0	6057.0		72.7
GS-7	LTM Forage Fish Project/ Fisheries Biologist	8.0	4286.0		34.3
GS-5	LTM Forage Fish Project/ Seasonal Tech	5.0	3225.0		16.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	13568.0	0.0	
				Personnel Total	$123.1

Travel Costs:		Ticket	Round	Total	Daily	Travel
Description		Price	Trips	Days	Per Diem	Sum
PI-Field Site	Airfare, M&IE	1,184	1	40	20.0	2.0
PI-Meeting	Airfare, hotel, M$IE	1,077	1	5	175.0	2.0
CO-PI Field Site	Airfare, M&IE	1,158	1	40	20.0	2.0
CO-PI Meeting	Airfare, hotel, M$IE	477	1	5	175.0	1.4
GS 9 Field Site	Airfare, M&IE	450	1	25	20.0	1.0
GS 7 Field Site	Airfare, M&IE	450	1	25	20.0	1.0
Volunteer Field Site	Airfare, M&IE	850	1	25	20.0	1.4
						0.0
						0.0
						0.0
						0.0
					Travel Total	$10.5

FY14

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Zooplankton (60*$185/sample)	11.1
Nutrients, chla (120*$25/sample)	3.0
Stable isotope analyses	14.3
Outreach	0.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$28.9

Commodities Costs: Description	Commodities Sum
Research Vessel Operations (including fuel, food, supplies)	20
Commodities Total	$20.0

FY14

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Calibration of CTD/sensors			1.80
EchoView Data license renewal (x2)			1.00
Other Sampling equipment			0.50
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$3.3

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Research Vessel M/V Gyre (with mid-water trawl capability)	1	USGS
Nets (beach seine, trawl, zooplankton)	5	USGS
Oceanographic equipment (CTD, Rossette, Thermosalinograph)	1	USGS
BIOSONICS DT-4000 Hydroacoustic system	2	USGS
Small boats (Naiad RIB, Zodiac)	2	USGS

FY14

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Piatt GS-15 (in kind)	LTM Forage Fish Project/Team Leader	2.0	0.0		0.0
Arimitsu GS-12 (in kind)	LTM Forage Fish Project/Project Leader	6.0	0.0		0.0
GS-9	LTM Forage Fish Project/ Fisheries Biologist	12.0	6057.0		72.7
GS-7	LTM Forage Fish Project/ Fisheries Biologist	8.0	4286.0		34.3
GS-5	LTM Forage Fish Project/ Seasonal Tech	5.0	3225.0		16.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	13568.0	0.0	
				Personnel Total	$123.1

Travel Costs:		Ticket	Round	Total	Daily	Travel
Description		Price	Trips	Days	Per Diem	Sum
PI-Field Site	Airfare, M&IE	1,184	1	40	20.0	2.0
PI-Meeting	Airfare, hotel, M$IE	1,077	1	5	175.0	2.0
CO-PI Field Site	Airfare, M&IE	1,158	1	40	20.0	2.0
CO-PI Meeting	Airfare, hotel, M$IE	477	1	5	175.0	1.4
GS 9 Field Site	Airfare, M&IE	450	1	25	20.0	1.0
GS 7 Field Site	Airfare, M&IE	450	1	25	20.0	1.0
Volunteer Field Site	Airfare, M&IE	850	1	25	20.0	1.4
						0.0
						0.0
						0.0
						0.0
					Travel Total	$10.5

FY15

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
PERSONNEL & TRAVEL
DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Zooplankton (60*$185/sample)	11.1
Nutrients, chla (120*$25/sample)	3.0
Stable isotope analyses	14.3
Outreach	0.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$28.9

Commodities Costs: Description	Commodities Sum
Research Vessel Operations (including fuel, food, supplies)	20
Commodities Total	$20.0

FY15

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Calibration of CTD/sensors			1.80
EchoView Data license renewal (x2)			1.00
Other Sampling equipment			0.50
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$3.3

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Research Vessel M/V Gyre (with mid-water trawl capability)	1	USGS
Nets (beach seine, trawl, zooplankton)	5	USGS
Oceanographic equipment (CTD, Rossette, Thermosalinograph)	1	USGS
BIOSONICS DT-4000 Hydroacoustic system	2	USGS
Small boats (Naiad RIB, Zodiac)	2	USGS

FY15

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Piatt GS-15 (in kind)	LTM Forage Fish Project/Team Leader	2.0	0.0		0.0
Arimitsu GS-12 (in kind)	LTM Forage Fish Project/Project Leader	6.0	0.0		0.0
GS-9	LTM Forage Fish Project/ Fisheries Biologist	12.0	6057.0		72.7
GS-7	LTM Forage Fish Project/ Fisheries Biologist	10.2	4645.0		47.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	10702.0	0.0	
				Personnel Total	$119.8

Travel Costs:		Ticket	Round	Total	Daily	Travel
Description		Price	Trips	Days	Per Diem	Sum
PI-Meeting	Airfare, hotel, M$IE	1,077	1	5	175.0	2.0
CO-PI Meeting	Airfare, hotel, M$IE	477	1	5	175.0	1.4
						0.0
						0.0
						0.0
						0.0
					Travel Total	$3.3

FY16

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
Stable Isotope Analyses	14.3
Outreach	0.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$14.8

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY16

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency
Research Vessel M/V Gyre (with mid-water trawl capability)	1	USGS
Nets (beach seine, trawl, zooplankton)	5	USGS
Oceanographic equipment (CTD, Rossette, Thermosalinograph)	1	USGS
BIOSONICS DT-4000 Hydroacoustic system	2	USGS
Small boats (Naiad RIB, Zodiac)	2	USGS

FY16

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

FY12 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Long-term monitoring: Environmental Drivers component - Long-term Monitoring of Oceanographic Conditions in the Alaska Coastal Current from Hydrographic Station GAK 1.

Project Period: October 1, 2011 – September 30, 2016

Primary Investigator(s): Thomas Weingartner, Principal Investigator, (weingart@ims.uaf.edu)

Study Location: Gulf of Alaska

Abstract: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al.

This program continues a 40-year time series of temperature and salinity measurements at hydrographic station GAK 1. The data set, which began in 1970, now consists of monthly CTDs and a mooring with 6 temperature/conductivity recorders throughout the water column, a fluorometer and nitrate sensor at 20 m depth and a nitrate sensor at 150 m depth. The project monitors four important Alaska Coastal Current ecosystem parameters that will quantify and help understand interannual and longer period variability in:

1. Temperature and salinity throughout the 250 m deep water column,
2. Near surface stratification,
3. Near and subsurface nitrate supply on the inner shelf,
4. Fluorescence as an index of phytoplankton biomass, and

In aggregate these variables are basic descriptors of the Alaska Coastal Current, an important habitat and migratory corridor for organisms inhabiting the northern Gulf of Alaska, including Prince William Sound.

Estimated Budget:
EVOSTC Funding Requested: including the 9% GA
FY12: $109,495, FY13:$112,538, FY14: $115,721, FY15: $119,051, FY16: $122,539, TOTAL: $579,343

Non-EVOSTC Funds to be used:
none

Date: May 31, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Justification

The purpose of this proposal is to provide long-term monitoring data on the physical oceanography of the Alaska Coastal Current and the northern GoA shelf. The Alaska Coastal Current (ACC) is the most prominent feature of the Gulf of Alaska's shelf circulation. It is a narrow (~40 km), swift, year-round flow maintained by the integrated forcing of winds and coastal freshwater discharge. That forcing is variable and reflected in ACC properties. The current originates on the British Columbian shelf and leaves the Gulf for the Bering Sea through Unimak Pass. Substantial portions of the ACC circulate through Prince William Sound and feed lower Cook Inlet and Kachemak Bay before flowing southwestward through Shelikof Strait. The current controls water exchange and transmits its properties into the fjords and bays between Prince William Sound and the Alaskan Peninsula. The monitoring proposed herein quantifies variability of the Gulf's shelf environment. ACC monitoring provides the broader-scale context for understanding variability in adjacent marine ecosystems and its affect on particular species (e.g., herring, salmon, forage fish). The ACC's variability is transmitted to nearshore habitats around the gulf.

Measurements at GAK 1 (Figure 4), at the mouth of Resurrection Bay, began in 1970. Initially the sampling was opportunistic, became more regular in the 1980s and 1990s, and systematic beginning in 1997 with EVOSTC support. Since then it involves involves monthly conductivity-temperature versus depth (CTD) casts and hourly temperature and salinity measurements at 6 depths distributed over the water column. GAK 1 is *the only station* in the GoA that measures both salinity and temperature over the 250 m deep water column.

The 40-year GAK 1 time series has documented:

1. The large interannual differences associated with El Nino and La Nina events, including substantial differences in the spring bloom between these phenomena (Weingartner et al., 2003, Childers et al., 2005).

2. The intimate connection between coastal freshwater discharge and the depth-varying evolution of winter and spring temperatures over the shelf (Janout et al., 2010; Janout 2009).

3. That GAK 1 is a reliable index of ACC transports of mass, heat, and freshwater (Weingartner et al., 2005).

4. That GAK 1 near-surface salinities are correlated with coastal freshwater discharge from around the Gulf (Weingartner et al., 2005).

5. Variations in mixed-layer depth in the northern Gulf, which affects primary production (Sakar et al., 2006)

6. Decadal scale trends in salinity and temperature, (Royer, 2005; Royer and Grosch, 2006; Weingartner et al., 2005, and Janout et al., 2010).

7. The relationships between temperature and salinity variations and the Pacific Decadal Oscillation and the strength and position of the Aleutian Low (Royer, 2005; Weingartner et al., 2005, and Janout et al., 2010)

8. That the record can guide understanding the variability in iron concentrations, a potentially limiting micro-nutrient required by many phytoplankton. Preliminary efforts indicate that iron and surface salinity are correlated at least in certain seasons (Wu, et al., 2008).

As shown by Meuter et al., (1994), Meuter (2004), and Spies (2009), these issues affect ecosystem processes on both the shelf and within Prince William Sound and Lower Cook Inlet/Kachemak Bay.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Please see pages 2-4 of the integrated proposal titled "Long-Term Monitoring of Marine Conditions and Injured Resources and Services," and submited by McCammon et. al

II. PROJECT DESIGN

A. Objectives

<u>Project Objectives:</u>

The fundamental goal of this program is to provide a high quality, long-term data to quantify and understand monthly, seasonal, interannual and longer period variability of the GoA shelf. This measurement provides the broader scale spatial perspective discussed on pages 1 -5. Specifically we will measure:

1. Temperature and salinity throughout the water column,
2. Near surface stratification since this affects phytoplankton bloom dynamics,
3. Near and subsurface nitrate supply on the inner shelf, since this important nutrient affects phytoplankton production,

<u>Project Integration</u>

Integration with other PIs and components of the monitoring, herring and lingering oil efforts were outlined on pages 1 – 5. In addition, we note that the GAK 1 effort has assisted others with their research. For example, in 2001-02 it provided a test bed for prototype halibut tags (developed by USGS-BRD scientists), which were then used to study halibut migrations in the GoA and Bering Sea. The data are being used by herring biologists to assess energetic costs of overwintering herring (Heintz, pers. comm), and it has been used studies of king crab (Bechtol, 2009), spiny dogfish Tribuzio (2009), the community structure of rocky coasts (Ingolfsson, 2005), and salmon (Boldt and Haldorson, 2002). We have recently had requests from Steve Moffit (ADF&G salmon biologist) to use this data as an aid in salmon forecasts and we are aware of several Gulf fishermen who routinely access this data set. After processing, the data will be posted to the GAK 1 website (http://www.ims.uaf.edu/gak1/) and submitted to the data management team for archiving.

Leveraging

We are collaborating at no cost to this proposal with National Park Service scientists at Glacier Bay who are sampling in Glacier Bay using CTD sampling and analysis protocols identical to those at GAK 1. Since southeast Alaska waters contribute to the ACC, the 15 year Glacier Bay time series provides the opportunity to assess variability in the northeast and northwest Gulf and to understand how these regions co-vary and how the ACC evolves as if flows westward toward Prince William Sound. The GAK 1 mooring includes a nitrate sensor that was provided by the Alaska Ocean Observing System (AOOS) to this project.

B. Procedural and Scientific Methods

Following past protocols, we propose monthly CTD measurements and year-long, continuous measurements from a subsurface mooring with temperature and conductivity (T/C) recorders placed at nominal depths of 20, 30, 60, 100, 150, 200, and 250 m. A (Wetlabs, Inc.) fluorometer is included at 20 m, to determine timing and duration of the spring and summer blooms. The fluorometer emits an illuminated beam of light (at 470 nm) that stimulates chlorophyll in the beam path. The absorbed light excites the chlorophyll molecules, which emit light (fluoresce) at a 695 nm. The emitted light is detected by the fluorometer and the intensity of the fluorescence is proportional to chlorophyll biomass. (Note that fluorescence is only a relative measure of chlorophyll concentration. We also include 1 - 2 ISUS (*In Situ* Ultraviolet Sensor) sensors at 20 m and at 150 m depth. These instruments optically determine nitrate based on the nitrate UV-absorption spectrum. This spectrum is unique for nitrate and it is resolved by the 256-channel ISUS spectrometer and interpreted by an algorithm developed by the Monterey Bay Aquarium Research Institute. The 20 m ISUS is within the euphotic zone and complements the fluorometer data. The 150 m ISUS will gauge the annual re-supply of nitrate to this shelf (and also Prince William Sound) through the annual exchange between deep shelf and slope waters. The deep water (and nitrate) is mixed to the surface in winter and is thereby available to phytoplankton at the onset of the spring bloom. ISUS sensors appear to provide sufficiently reliable data ($\pm$ 2 μM) for a whole year. The ISUS sensors are provided at no cost to this project because they were provided (and will be maintained) with support from the Alaska Ocean Observing System.

The moored instruments and monthly CTD sampling schemes are complementary; one provides high vertical resolution at monthly time scales and the other provides high temporal resolution, but at coarser vertical spacing. The monthly CTDs provide redundancy in the event an instrument fails on the mooring. The GAK 1 monthly temperature and salinity are statistically significant predictors of monthly anomalies of the alongshelf baroclinic transport in the ACC (from November – August) so ACC transport anomalies are monitored indirectly from the GAK 1 data.

The moored T/C recorders are Microcats (at depths greater than 20 m) and a SeaCat (at 20 m depth to incorporate the fluorometer) both manufactured by Seabird, Inc. Seabird performs pre- and post-calibrations upon which we determine sensor drift (typically ~0.01^{o}C -yr^{-1} and ~0.03, or better, Practical Salinity Unit yr^{-1}). The monthly CTD casts are collected from a chartered fishing vessel resident in Seward using a portable CTD (Seabird SBE-25). The SBE 25 has an accuracy ~0.01 or better for salinity and .005^{o}C for temperature. Bio-fouling will gradually degrade the signal quality of the fluorometer so we strive to deploy the mooring in March or early April (depending upon weather) in order to minimize fouling potential prior to the spring bloom in April or May. Temperature and salinity data are sampled at 15-minute intervals except at 20 m depth where power supply considerations for the fluorometer and ISUS dictate hourly sampling.

The GAK 1 sampling approach will be identical to that supported by EVOSTC in the recent past: monthly CTDs and maintenance of the year-round oceanographic mooring. Sampling is cost-effectively serviced from Seward using local charters or small boats operated by the Seward Marine Center.

C. Data Analysis and Statistical Methods

The temperature and salinity data analyses are straightforward. We will compute standard statistical estimates for each month and depth and compare these with historical data since the thrust of this effort is to quantify interannual variability. We continue to incorporate an integrated discharge time series and air-sea heat fluxes derived from National Center for Environmental Prediction (NCEP) in our analyses of salinity and temperature variability. We have generated the historical heat flux calculations which show that winter heat losses (from the ocean to the atmosphere) are more variable both interannually and at longer periods than summer heat gains. For example, winter heat loss has decreased by nearly 20% since the mid-1970s and this change was reflected in the warming at GAK 1 through 2005. Since that time winter heat loss has increased substantially and returned to values that occurred in the early 1970s. Winter heat loss, in conjunction, with runoff, affects the ocean temperature distribution through spring when many young larvae are emerging to feed (*Janout et al*., 2010). On the other hand summer heat gains appear to be relatively consistent from year to year because this is primarily a function of cloud cover. *Royer et al*. (2006) contend that summer surface temperatures over the shelf and in Prince William Sound are primarily a function of the stratification. They suggest that stronger stratification traps heat in the surface layer and elevates surface temperatures, whereas weaker stratification allows the solar energy to diffuse to greater depths. Within the ACC, stratification is primarily a function of the vertical salinity gradients that we are measuring at GAK 1.

We will also quantify spring and summer phytoplankton blooms in relation to changes in stratification, runoff, and winds. Stratification estimates will be made from the 3 uppermost instruments and the monthly CTD surveys. The fluorescence data will provide an estimate of the number of blooms and bloom duration observed in spring and summer. This approach is necessarily subjective since a bloom event is defined with reference to a base line, which may drift over time because of bio-fouling. However, when present, biofouling develops after the spring bloom, so our qualitative descriptions are primarily valuable in describing year-to-year variability of the spring bloom. GLOBEC measurements, as well as those by *Eslinger et al.* (2001) from Prince William Sound, indicate that the timing of the spring bloom varies considerably from year-to-year perhaps by as much as several weeks. *Weingartner et al*. (2003) show that the onset of the spring bloom on the Gulf of Alaska shelf is tied to the quantity and phasing of winter and early spring runoff because freshwater is the principal stratifying agent in the ACC in both seasons. For example, the spring bloom in the ACC was delayed until May in 2007 and 2008 because of the weak stratification; in contrast it occurred between early to mid-April during the GLOBEC years when winters were wetter and warmer.

D. Description of Study Area
The fieldwork will be conducted at Station GAK1 at the mouth of Resurrection Bay. The station is at ~59^{o} 51'N, 149^{o} 28'W, and is located on the inner edge of the ACC midway between Prince William Sound and Cook Inlet in approximately 265 m water depth.

E. Coordination and Collaboration with Other Efforts
All data sets will be available on the GAK 1 website (http://www.ims.uaf.edu/gak1/). The GAK 1 data will thus be available to other scientists in the Long-Term Monitoring program as well as other interested scientists outside of the program. As discussed above this project is being supplemented by the Alaska Ocean Observing System (AOOS), which is providing the ISUS nitrate samplers (with each sampler costing $30,000). We have assisted the National Park Service in establishing a similar monthly sampling and data processing protocol in Glacier Bay National Park. That data will be made available to this project. The sampling in Glacier Bay therefore provides a complementary data set that is made upstream (in terms of the general circulation characteristics of the GOA shelf. Collectively, the Glacier Bay and GAK1 data sets provide a broad-scale perspective of the GOA shelf environment.

III. SCHEDULE
A. Project Milestones

Objective 1. Monthly CTDs will be updated quarterly and placed on the website and the moored measurements will be made available by March-April following the year that the mooring is recovered. This allows time for the instruments to be calibrated (at the manufacturer and the post-calibrations applied to the data set.

Objective 2. Determine seasonal changes in near surface stratification since this affects phytoplankton bloom dynamics. Updated annually in accordance with the processing of the mooring data.

Objective 3. Determine near and subsurface nitrate supply on the inner shelf, since this important nutrient affects phytoplankton production. Updated annually in accordance with the processing of the mooring data.

B. Measurable Project Tasks

FFY 11, 2nd quarter (January 1, 2011-March 31, 2011)
February: *Project funding approved by Trustee Council*

FFY 11, 3rd quarter (April 1, 2011-June 30, 2011)
April, May, June Monthly CTD surveys

FFY 11, 4th quarter (July 1, 2011-September 30, 2011)
August, September: Monthly CTD surveys

FFY 12, 1st quarter (October 1, 2011-December 31, 2011)
October, November, December: Monthly CTD surveys *Begin analysis and report writing*

FFY 12, 2nd quarter (January 1, 2012-March 31, 2012)
January 18: *Annual Marine Science Symposium*
January, February, March: Monthly CTD surveys
March: re-deploy GAK 1 mooring

FFY 12, 3rd quarter (April 1, 2012-June 30, 2012)
April 15 *Submit final report.*
April, May: Monthly CTD surveys

UAF GAK component:

Statement of Work

The University of Alaska will perform the following tasks under this project:

1. Arrange logistics and occupy hydrographic station GAK 1 8 – 12 times/year at approximately monthly intervals. The number of occupations will depend on vessel charter costs.
2. Perform annual maintenance of the GAK 1 mooring to include fabrication, deployment and recovery of the mooring, and acquisition of new equipment if needed.
3. Calibrate all instruments and quality control all data.
4. Post data online at http://www.ims.uaf.edu/gak1/ and transmit for archival to the Data Coordination Center.
5. Participate in meetings with other PIs and prepare annual reports.

Budget Justification

Salary support
Dr. Thomas Weingartner is the project PI and is responsible for project management. He will devote 0.5 months per year to the project. Mr. Seth Danielson is a physical oceanographer who has worked on both the GLOBEC and EVOSTC GAK 1 projects for several years and coordinates with the Glacier Bay NPS in their ocean monitoring program. He is responsible for data processing, analyses, and maintenance of the project web page. We request support for 1.0 month/year of his time. Mr. David Leech is the Seward based mooring and marine technician responsible for the design, fabrication, deployment and recovery of the mooring and maintenance of all of the instruments. He also conducts the monthly CTD sampling. He will spend 1.0 month/year on the project collecting CTDs and 1 month/year fabricating the mooring and conducting the mooring turnaround. His overtime covers the days he is at sea working on this project. All members of this research team are affiliated with the University of Alaska.

Benefits
Staff benefits are applied according to UAF's fixed benefit rates for FY11 with the Office of Naval Research (ONR). A copy of the negotiated rate proposal is available at: http://www.alaska.edu/cost-analysis/negotiation-agreements.

Travel
Funds for one person to travel (round-trip Fairbanks – Seward) with 4 days per diem to participate in the mooring turnaround.

Ten percent has been added to airfare, car rental and taxi travel beginning in year 2 to accommodate anticipated price increases. Per diem (food, lodging and mileage) have not been increased. We reserve the right to travel to other domestic locations as may be necessary to fulfill the requirements of the proposal.

Services
The service request includes funds for instrument calibrations ($1,520 per year) and the shipping ($800 per year) of these to and from Seabird in Seattle. Additional funds ($12,000 per year) are needed to cover the costs for 8 days for the monthly CTD sampling periods. (Two months will be covered by the annual Seward Line cruises and an additional sampling period will be covered by the mooring cruise.) The

mooring recovery/deployment must be done from a larger vessel and we are requesting funds ($4,000 per year) to charter a Seward-based fishing vessel to accomplish this task.

Supplies
No supplies are requested

Equipment ($10,015 per year)
We request funds to purchase one MicroCat per year equipped with a strain gauge pressure sensor. These instruments will gradually retire those that have been dedicated to this project and which are now nearing 10 years old. Additional funds are requested for assembling the mooring.

Indirect Costs
Facilities and Administrative (F&A) Costs are negotiated with the State of Alaska and the rate for research is calculated at 25% of the Modified Total Direct Costs (MTDC). MTDC includes Total Direct Costs minus tuition, scholarships, subaward amounts over $25,000, and equipment. A copy of the agreement is available at: http://www.alaska.edu/cost-analysis/negotiation-agreements.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$52.7	$55.1	$57.5	$60.1	$62.8	$288.2
Travel	$1.4	$1.5	$1.5	$1.6	$1.7	$7.8
Contractual	$22.9	$22.9	$22.9	$22.9	$22.9	$114.6
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Equipment	$10.0	$10.0	$10.0	$10.0	$10.0	$50.1
Indirect Costs (*will vary by proposer*)	$13.4	$13.8	$14.2	$14.5	$14.9	$70.8
SUBTOTAL	$100.5	$103.2	$106.2	$109.2	$112.4	$531.5
General Administration (9% of subtotal)	$9.0	$9.3	$9.6	$9.8	$10.1	$47.8
PROJECT TOTAL	$109.5	$112.5	$115.7	$119.1	$122.5	$579.3
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS:

FY12-16

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3A
NON-TRUSTEE AGENCY
SUMMARY

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
T. Weingartner	PI	0.5	12.624		6.312
Technician 1		2.0	10.549	12.712	33.810
Technician 2		1.0	12.563		12.563
		Subtotal	35.7	12.7	
				Personnel Total	$52.7

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (for cruise)	0.350	1	4	0.262	1.4
				Travel Total	$1.4

FY12

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description		Contract Sum
vessel charter for CTDs (8 1-day trips, $1500/day)		12.000
vessel charter for morrings (1 2-day trip, $2000/day)		4.000
MicroCat and SeaCat calibrations (6 @ $600, 1 @ $1000)		4.600
SEBE-25 calibration		1.520
shipping		0.800
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$22.9

Commodities Costs: Description	Commodities Sum
project supplies	0.000
Commodities Total	$0.0

FY12

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Seabird 37SMP Microcat with pressure	1.0	4.565	4.565
miscellaneous mooring hardware	1.0	5.450	5.450
		New Equipment Total	$10.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY12

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
T. Weingartner	PI	0.5	13.194		6.597
Technician 1		2.0	11.024	13.284	35.332
Technician 2		1.0	13.129		13.129
		Subtotal	37.3	13.3	
				Personnel Total	$55.1

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (for cruise)	0.385	1	4	0.271	1.5
				Travel Total	$1.5

FY13

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
PERSONNEL & TRAVEL
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description		Contract Sum
vessel charter for CTDs (8 1-day trips, $1500/day)		12.000
vessel charter for morrings (1 2-day trip, $2000/day)		4.000
MicroCat and SeaCat calibrations (6 @ $600, 1 @ $1000)		4.600
SEBE-25 calibration		1.520
shipping		0.800
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$22.9

Commodities Costs: Description	Commodities Sum
Project Supplies	0.0
Commodities Total	$0.0

FY13

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Seabird 37SMP Microcat with pressure	1.0	4.565	4.565
miscellaneous mooring hardware	1.0	5.450	5.450
		New Equipment Total	$10.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY13

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
T. Weingartner	PI	0.5	13.786		6.893
Technician 1		2.0	11.520	13.883	36.923
Technician 2		1.0	13.719		13.719
		Subtotal	39.0	13.9	
				Personnel Total	$57.5

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (for cruise)	0.424	1	4	0.281	1.548
				Travel Total	$1.5

FY14

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
PERSONNEL & TRAVEL DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description		Contract Sum
vessel charter for CTDs (8 1-day trips, $1500/day)		12.000
vessel charter for morrings (1 2-day trip, $2000/day)		4.000
MicroCat and SeaCat calibrations (6 @ $600, 1 @ $1000)		4.600
SEBE-25 calibration		1.520
shipping		0.800
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$22.9

Commodities Costs: Description	Commodities Sum
Project Supplies	0.0
Commodities Total	$0.0

FY14

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Seabird 37SMP Microcat with pressure	1.0	4.565	4.565
miscellaneous mooring hardware	1.0	5.450	5.450
		New Equipment Total	$10.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY14

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
EQUIPMENT DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
T. Weingartner	PI	0.5	14.408		7.204
Technician 1		2.0	12.038	14.508	38.584
Technician 2		1.0	14.336		14.336
		Subtotal	40.8	14.5	
				Personnel Total	$60.1

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (for cruise)	0.466	1	4	0.291	1.630
				Travel Total	$1.6

FY15

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
PERSONNEL & TRAVEL
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
vessel charter for CTDs (8 1-day trips, $1500/day)	12.000
vessel charter for morrings (1 2-day trip, $2000/day)	4.000
MicroCat and SeaCat calibrations (6 @ $600, 1 @ $1000)	4.600
SEBE-25 calibration	1.520
shipping	0.800
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$22.9

Commodities Costs: Description	Commodities Sum
Project Supplies	0.0
Commodities Total	$0.0

FY15

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Seabird 37SMP Microcat with pressure	1.0	4.565	4.565
miscellaneous mooring hardware	1.0	5.450	5.450
		New Equipment Total	$10.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY15

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
EQUIPMENT DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
T. Weingartner	PI	0.5	15.056		7.528
Technician 1		2.0	12.580	15.161	40.321
Technician 2		1.0	14.981		14.981
		Subtotal	42.6	15.2	
				Personnel Total	$62.8

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (for cruise)	0.512	1	4	0.303	1.724
				Travel Total	$1.7

FY16

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
PERSONNEL & TRAVEL
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description	Contract Sum
vessel charter for CTDs (8 1-day trips, $1500/day)	12.000
vessel charter for morrings (1 2-day trip, $2000/day)	4.000
MicroCat and SeaCat calibrations (6 @ $600, 1 @ $1000)	4.600
SEBE-25 calibration	1.520
shipping	0.800
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$22.9

Commodities Costs: Description	Commodities Sum
Project Supplies	0.0
Commodities Total	$0.0

FY16

Program Title: GAK Component
Team Leader: T. Weingartner

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Seabird 37SMP Microcat with pressure	1.0	4.565	4.565
miscellaneous mooring hardware	1.0	5.450	5.450
		New Equipment Total	$10.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title:
Team Leader:

FORM 3B
EQUIPMENT DETAIL

replaces Pg. 25 of Proposal submitted 3/1/11

6/17/2011 CORRECTED

Long-Term Monitoring Proposal Budget - 2011-2016 - Costs in $K

Principal Investigators and Institution	Activity - short project title	Yr1	Yr2	Yr3	Yr4	Yr5	5 Yr TOTAL
	Environmental Drivers						
Campbell, *PWSSC*	Prince William Sound Oceanographic	218.4	177.3	181.1	186.9	192.0	***955.6***
Weingartner, *UAF*	GAK1 (Gulf of Alaska) Mooring	100.5	103.2	106.2	109.2	112.4	***531.5***
Hopcroft, *UAF*	Seward Line	90.0	54.9	92.2	95.4	98.8	***431.4***
Doroff, ADFG; and Holderied, *NOAA*	Lower Cook Inlet Oceanographic	176.0	162.7	152.7	122.7	99.8	***714.0***
Batten, *SAHFOS*	Continuous plankton recorder (CPR)	0.0	61.3	63.1	64.9	67.1	***256.4***
	Environmental Drivers Total	**584.9**	**559.5**	**595.2**	**579.1**	**570.2**	2,888.9
	Pelagic Monitoring						
Matkin, *NGOS*	Killer whale monitoring	6.6	121.9	121.9	122.0	122.0	***494.2***
Moran, *NOAA* ; and Straley, *UAS*	Humpback whale monitoring	116.9	118.2	128.1	129.9	49.9	***543.0***
Piatt, *USGS*	Forage fish	192.6	185.7	185.7	185.7	137.9	***887.7***
Irons, *USGS* ; and Kuletz, *USFWS*	Nearshore marine birds surveys	189.3	22.2	193.6	22.2	197.8	***625.2***
Coletti, NPS	Bird synthesis	30.0	0.0	0.0	0.0	0.0	***30.0***
Bishop, *PWSSC*	Seabird monitoring in late fall/winter	47.4	72.1	74.2	76.5	79.2	***349.4***
	Pelagic Monitoring Total	**582.7**	**520.1**	**703.6**	**536.3**	**586.8**	2,929.5
	Benthic Monitoring						
Ballachey, *USGS* ; and Dean, *CRA, Inc* .	Nearshore benthic PWS (sea otters, seagrass/kelp, intertidal invertebrates/ algae, benthic voraging seabirds)	259.1	279.0	304.5	284.0	304.5	***1,431.1***
Konar and Iken, *UAF*	Kachemak Bay Intertidal	44.1	44.2	44.1	44.1	43.5	***220.0***
	Benthic Monitoring Total	**303.2**	**323.2**	**348.6**	**328.1**	**348.0**	1,651.1
	Coordination, Data Management, Outreach and Administration						
Holderied, *NOAA*	Science Synthesis/ Coordination	113.3	127.5	136.1	134.0	139.1	***650.0***
McCammon, *AOOS* /Bochenek, *Axiom*	Data Management	150.0	149.9	150.4	150.4	149.2	***749.9***
Hollmen, *ASLC*	Ecological modeling	76.2	84.3	87.7	72.1	75.1	***395.4***
Bird, *PWSSC* / McCammon, AOOS	Administration, science review and LTM mtg logistics, Outreach & Communications	241.6	252.1	273.9	269.2	264.3	***1,301.1***
	Coordination, Data Management, Outreach and Administration Total	**581.1**	**613.7**	**648.2**	**625.7**	**627.7**	3,096.4
	Overall Program Total Cost	**2,051.9**	**2,016.5**	**2,295.6**	**2,069.2**	**2,132.7**	10,565.9
	Lingering Oil Monitoring						
Carls, *NOAA*	1 - Extending tracking oil composition and weathering in PWS	18.0	12.0	155.2	8.0	6.0	***199.2***
Ballachey, *NOAA* , & Esler, *Simon Fraser Univ. & Pacific Wildlife Fdtn*	2a & b - Evaluate chronic exposure of sea otters and harlequin ducks in PWS	187.4	0.0	0.0	0.0	0.0	***187.4***
	Lingering Oil Monitoring Total	**205.4**	**12.0**	**155.2**	**8.0**	**6.0**	**386.6**
		2,257.3	2,028.5	2,450.8	2,077.2	2,138.7	10,952.5

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$12.4	$121.6	$125.4	$131.2	$136.3	$526.8
Travel	$0.0	$1.0	$1.0	$1.0	$1.0	$4.0
Contractual	$1.0	$43.7	$43.7	$43.7	$43.7	$175.8
Commodities	$0.0	$11.0	$11.0	$11.0	$11.0	$44.0
Equipment	$205.0	$0.0	$0.0	$0.0	$0.0	$205.0
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$218.4	$177.3	$181.1	$186.9	$192.0	$955.6
General Administration (9% of subtotal)	$19.7	$16.0	$16.3	$16.8	$17.3	$86.0
PROJECT TOTAL	$238.1	$193.2	$197.3	$203.7	$209.3	$1,041.6
Other Resources (Cost Share Funds)	$23.3	$23.3	$23.3	$23.3	$23.3	$116.5

COMMENTS:The Science Center waives Indirect Costs for this project due to its administration of the overall proposal. The Science Center will contribute all field sampling gear including a CTD, chlorophyll fluorometer, transmissometer, Submersible Ultraviolet Nitrate Analyser, plankton net, ropes, cables and sampling bottles. The field equipment has a replacement value of on order of $50,000. The Science Center will also contribute a Turner designs fluorometer for the analysis of chlorophyll, and assorted laboratory glassware, with an approximate replacement value of $20,000. For the purposes of cost share calcuations, the annual cost is estimated at 1/3 of the replacement cost.

FY12-16

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$28.8	$35.3	$68.8	$71.8	$75.1	$279.7
Travel	$2.5	$2.6	$1.4	$1.5	$1.6	$9.5
Contractual	$49.0	$3.0	$1.5	$1.5	$1.5	$56.5
Commodities	$1.2	$3.0	$2.1	$1.5	$0.9	$8.7
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$8.6	$11.0	$18.4	$19.1	$19.8	$76.9
SUBTOTAL	$90.0	$54.9	$92.2	$95.4	$98.8	$431.4
General Administration (9% of subtotal)	$8.1	$4.9	$8.3	$8.6	$8.9	$38.8
PROJECT TOTAL	$98.1	$59.9	$100.5	$104.0	$107.7	$470.2
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In this box, identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

FY12-16

Program Title: Seward Line
Team Leader: R. Hopcroft

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$52.7	$55.1	$57.5	$60.1	$62.8	$288.2
Travel	$1.4	$1.5	$1.5	$1.6	$1.7	$7.8
Contractual	$22.9	$22.9	$22.9	$22.9	$22.9	$114.6
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Equipment	$10.0	$10.0	$10.0	$10.0	$10.0	$50.1
Indirect Costs (*will vary by proposer*)	$13.4	$13.8	$14.2	$14.5	$14.9	$70.8
SUBTOTAL	$100.5	$103.2	$106.2	$109.2	$112.4	$531.5
General Administration (9% of subtotal)	$9.0	$9.3	$9.6	$9.8	$10.1	$47.8
PROJECT TOTAL	$109.5	$112.5	$337.8	$119.1	$122.5	$579.3
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In this box, identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

FY12-16

Program Title: GAK Component
Team Leader: T. Weingartner

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$66.0	$69.3	$72.8	$64.2	$63.2	$335.5
Travel	$7.8	$7.8	$7.8	$12.7	$7.8	$44.1
Contractual	$52.3	$54.3	$54.3	$28.3	$14.3	$203.5
Commodities	$21.1	$23.6	$17.8	$17.4	$14.5	$94.4
Equipment	$28.8	$7.7	$0.0	$0.0	$0.0	$36.5
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$176.0	$162.7	$152.7	$122.7	$99.8	$714.0
General Administration (9% of subtotal)	$15.8	$14.6	$13.7	$11.0	$9.0	$64.3
PROJECT TOTAL	$191.9	$177.4	$166.5	$133.7	$108.8	$778.2
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

In-Kind contributions: FY12 - FY16: $600.0 K in NOAA System-Wide Monitoring Program ($120.0K/year)
FY12 - FY16: $50.0K in CTD equipment ($10.0K/year)
FY12 - FY16: $125.0K in salary support for Kris Holderied and KBL staff ($25.0K/year)

FY12-16

Program Title: LTM-Lower Cook Inlet
Team Leader: Doroff and Holderied

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$31.8	$32.7	$33.8	$35.0	$133.3
Travel	$0.0	$1.0	$1.0	$1.0	$1.1	$4.1
Contractual	$0.0	$7.2	$7.4	$7.5	$7.9	$30.0
Commodities	$0.0	$4.5	$4.7	$4.8	$4.8	$18.8
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$0.0	$16.8	$17.3	$17.8	$18.3	$70.2
SUBTOTAL	$0.0	$61.3	$63.1	$64.9	$67.1	$256.4
General Administration (9% of subtotal)	$0.0	$5.5	$5.7	$5.8	$6.0	$23.1
PROJECT TOTAL	$0.0	$66.8	$68.8	$70.7	$73.1	$279.5
Other Resources (Cost Share Funds)	$0.0	$91.9	$94.7	$97.3	$100.7	$384.6

The North Pacific CPR survey is supported by a Consortium managed by the North Pacific Marine Science Organisation, of which the EVOS TC is a member. Costs included here are estimated at 40% of the full costs of acquiring data along the north-south transect. The remining funds will come from the consortium which currently includes the NPRB, Canadian Dept Fisheries and oceans and SAHFOS.

FY12-16

Program Title:
Team Leader:

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$34.3	$34.3	$34.3	$34.3	$137.0
Travel	$0.0	$1.4	$1.4	$1.5	$1.5	$5.8
Contractual	$0.0	$38.5	$38.5	$38.5	$38.5	$154.0
Commodities	$6.0	$36.2	$36.2	$36.2	$36.2	$150.8
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	0.6	11.5	$11.5	$11.5	$11.5	$46.6
SUBTOTAL	$6.6	$121.9	$121.9	$122.0	$122.0	$494.2
General Administration (9% of subtotal)	$0.6	$11.0	$11.0	$11.0	$11.0	$44.5
PROJECT TOTAL	$7.2	$132.8	$132.8	$132.9	$132.9	$538.7
Other Resources (Cost Share Funds)	$23.5	$23.5	$23.5	$23.5	$23.5	$117.5

Annually:15,000 Northwest Fisheries Science Center, Environmental Contaminant Lab: additional analytical and reporting services.
3,500 Norcross Wildlife Foundation, Equipment grant 5,000 NGOS in kind equiment use

FY12-16

Program Title: Long Term Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$2.0	$2.0	$2.0	$2.0	$0.0	$8.0
Travel	$5.4	$5.4	$5.4	$5.4	$1.8	$23.4
Contractual	$103.5	$104.8	$114.7	$116.5	$46.1	$485.6
Commodities	$6.0	$6.0	$6.0	$6.0	$2.0	$26.0
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$116.9	$118.2	$128.1	$129.9	$49.9	$543.0
General Administration (9% of subtotal)	$10.5	$10.6	$11.5	$11.7	$4.5	$48.9
PROJECT TOTAL	$127.4	$128.8	$139.6	$141.6	$54.4	$591.9
Other Resources (Cost Share Funds)	$25.0	$25.0	$25.0	$25.0	$25.0	$125.0

COMMENTS: In-kind contribution from NOAA - Three month salary/year for Moran.

FY12-16

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$123.1	$123.1	$123.1	$123.1	$119.8	$612.2
Travel	$11.4	$10.5	$10.5	$10.5	$3.3	$46.2
Contractual	$14.6	$28.9	$28.9	$28.9	$14.8	$115.9
Commodities	$20.0	$20.0	$20.0	$20.0	$0.0	$80.0
Equipment	$23.5	$3.3	$3.3	$3.3	$0.0	$33.4
Indirect Costs (*will vary by proposer*)						
SUBTOTAL	$192.6	$185.7	$185.7	$185.7	$137.9	$887.7
General Administration (9% of subtotal)	$17.3	$16.7	$16.7	$16.7	$12.4	$79.9
PROJECT TOTAL	$209.9	$202.5	$202.5	$202.5	$150.3	$967.6
Other Resources (Cost Share Funds)	$297.2	$297.2	$297.2	$297.2	$72.2	$1,260.8

Over life of the project, USGS will make a substantial contribution of salary (360.8K) for PIs (0.5 FTE GS-11, 0.2 FTE GS-15), half of the vessel costs for annual cruises (80K), and in each year all the field equipment required including sampling nets (5K; beach seine, modified herring trawl, zooplankton nets), oceanography equipment (90K; CTD with rosette and external sensors, thermosalinograph), BIOSONICS DTX-4000 digital hydroacoustic equipment (104K), and small boats (10.5K).

FY12-16

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$100.0	$22.2	$100.0	$22.2	$100.0	$344.3
Travel	$11.6	$0.0	$11.8	$0.0	$11.8	$35.3
Contractual	$37.1	$0.0	$37.1	$0.0	$37.1	$111.3
Commodities	$34.6	$0.0	$38.8	$0.0	$43.0	$116.3
Equipment	$6.0	$0.0	$6.0	$0.0	$6.0	$18.0
Indirect Costs (*will vary by proposer*)						
SUBTOTAL	$189.3	$22.2	$193.6	$22.2	$197.8	$625.2
General Administration (9% of subtotal)	$17.0	$2.0	$17.4	$2.0	$17.8	$56.3
PROJECT TOTAL	$206.3	$24.2	$211.1	$24.2	$215.7	$681.4
Other Resources (Cost Share Funds)	$56.0	$22.0	$56.0	$22.0	$56.0	$212.0

COMMENTS: Cost share funds from USFWS TOTAL $212,000.00
Kathy Kuletz salary (GS12 for 1 month/year x 5 yrs) = $55K David Irons salary (GS13 for 1 month/year x 5 yrs) = $55K
Boat user fee (180 days @ $300/day) = $54K
Equipment user fee @$12K/yr (computers, survival suits, electronics, etc.) = $36K
GSA vehicle user fee @ $4K/yr = $12K

FY12-16

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends.
Team Leader:

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$30.0	$0.0	$0.0	$0.0	$0.0	$30.0
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$30.0	$0.0	$0.0	$0.0	$0.0	$30.0
General Administration (9% of subtotal)	$2.7	$0.0	$0.0	$0.0	$0.0	$2.7
PROJECT TOTAL	$32.7	$0.0	$0.0	$0.0	$0.0	$32.7
Other Resources (Cost Share Funds)	$20.0	$0.0	$0.0	$0.0	$0.0	$20.0

COMMENTS: In-kind contributions will be for the staff time, primarily from NPS (approximately 2 months of a GS 12), but also from USFWS and USGS, to gather and provide the data to the contractor as well as provide expertise as to ecosystem processes and provide assistance in the compilation and reporting of results.

FY12-16

Program Title:
Team Leader:

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$46.0	$70.0	$72.0	$74.3	$77.3	$339.6
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$1.4	$2.1	$2.1	$2.1	$1.8	$9.5
Commodities	$0.0	$0.0	$0.1	$0.1	$0.1	$0.3
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$47.4	$72.1	$74.2	$76.5	$79.2	$349.4
General Administration (9% of subtotal)	$4.3	$6.5	$6.7	$6.9	$7.1	$31.5
PROJECT TOTAL	$51.7	$78.6	$80.9	$83.4	$86.3	$380.9
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: PWSSC waives the indirect cost on this proposal due to its administration of the overall proposal. This project is part of the Long-Term Monitoring of Marine Conditions and Injured Resources and Services (LTM), Pelagic Monitoring Component. We are using vessels of opportunity for the seabird observers. Vessel costs are in the LTM project Humpback whale monitoring and in the proposal by W.S. Pegau, PWS Herring Research & Monitoring.

FY12-16

Program Title: Long-term Monitoring of PWS - Seabird Monitoring
Team Leader: M.A. Bishop

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$110.0	$160.0	$160.0	$160.0	$160.0	$750.0
Travel	$3.5	$5.0	$5.0	$5.0	$5.0	$23.5
Contractual	$118.5	$103.0	$125.0	$103.0	$125.0	$574.5
Commodities	$5.1	$9.0	$9.0	$9.0	$9.0	$41.1
Equipment	$22.0	$2.0	$5.5	$7.0	$5.5	$42.0
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$259.1	$279.0	$304.5	$284.0	$304.5	$1,431.1
General Administration (9% of subtotal)	$23.3	$25.1	$27.4	$25.6	$27.4	$128.8
PROJECT TOTAL	$282.4	$304.1	$331.9	$309.6	$331.9	$1,559.9
Other Resources (Cost Share Funds)	$20,000.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: Annual in-kind contributions from USGS consist of staff time (J. Bodkin, K. Kloecker, G. Esslinger, G. Snedgen: $50K), reduced costs for charter vessel time ($23K), significant use of USGS equipment such as inflatables/outboards, GPSs, spotting scopes, field laptops, sounding equipment (eelgrass sampling).

FY12-16

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$20.0	$20.7	$21.3	$22.0	$21.8	$105.8
Travel	$1.0	$1.0	$1.0	$1.0	$1.0	$5.0
Contractual	$6.4	$5.9	$5.2	$4.5	$4.5	$26.5
Commodities	$2.1	$2.0	$2.0	$2.0	$1.5	$9.6
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$14.6	$14.6	$14.6	$14.6	$14.7	$73.1
SUBTOTAL	$44.1	$44.2	$44.1	$44.1	$43.5	$220.0
General Administration (9% of subtotal)	$4.0	$4.0	$4.0	$4.0	$3.9	$19.8
PROJECT TOTAL	$48.1	$48.2	$48.1	$48.1	$47.4	$239.8
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In this box, identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

FY12-16

Program Title:
Team Leader:

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$90.0	$111.6	$115.2	$117.6	$121.2	$555.6
Travel	$10.8	$9.4	$11.4	$9.9	$11.4	$52.9
Contractual	$7.5	$5.5	$5.5	$5.5	$5.5	$29.5
Commodities	$1.0	$1.0	$1.0	$1.0	$1.0	$5.0
Equipment	$4.0	$0.0	$3.0	$0.0	$0.0	$7.0
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$113.3	$127.5	$136.1	$134.0	$139.1	$650.0
General Administration (9% of subtotal)	$10.2	$11.5	$12.2	$12.1	$12.5	$58.5
PROJECT TOTAL	$123.5	$139.0	$148.3	$146.1	$151.6	$708.5
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

In-Kind contributions: FY12 - FY16: $65.0K in salary support for Kris Holderied ($13.0K/year)

FY12-16

Program Title: Long-Term Monitoring - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$117.8	$118.0	$122.3	$122.3	$121.3	$601.7
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Equipment	$5.1	$4.8	$0.0	$0.0	$0.0	$9.9
Indirect Costs (*will vary by proposer*)	$27.1	$27.1	$28.1	$28.1	$27.9	$138.4
SUBTOTAL	$150.0	$149.9	$150.4	$150.4	$149.2	$749.9
General Administration (9% of subtotal)	$13.5	$13.5	$13.5	$13.5	$13.4	$67.5
PROJECT TOTAL	$163.5	$163.4	$164.0	$164.0	$162.6	$817.4
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

Levraged Funding Sources
AOOS - Data management Activities (FY12 - 500K, FY13 - 500K, FY14 - 500K, FY15 - 500K, FY16 - 500k)
PWSSC -Project level data management system (FY12 - 48K)
Northern Forum/USFWS - North Pacific Seabird Data System (FY12 - 50K, FY13 - 50K, FY14 -50K)
ADF&G/AOOS - Data integration partnership/sharing (FY12 - 60K, FY13 - 90K, FY14 -70K)
CIRCAC - Regional Data Management Support for CI (FY12 - 25K)

FY12-16

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$10.0	$14.4	$19.2	$20.1	$21.0	$84.7
Travel	$5.7	$5.7	$5.7	$5.7	$5.7	$28.5
Contractual	$38.4	$40.2	$42.0	$29.2	$30.6	$180.4
Commodities	$4.0	$4.0	$0.0	$0.0	$0.0	$8.0
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$18.1	$20.0	$20.8	$17.1	$17.8	$93.8
SUBTOTAL	$76.2	$84.3	$87.7	$72.1	$75.1	$395.4
General Administration (9% of subtotal)	$6.9	$7.6	$7.9	$6.5	$6.8	$35.6
PROJECT TOTAL	$83.1	$91.9	$95.6	$78.6	$81.9	$431.0
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: In this box, identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

FY12-16

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$118.8	$122.4	$130.4	$127.3	$129.9	$628.8
Travel	$48.3	$51.6	$55.6	$59.7	$61.7	$276.9
Contractual	$69.5	$75.0	$84.5	$81.2	$70.2	$380.5
Commodities	$5.0	$3.0	$3.4	$1.0	$2.5	$14.9
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	waived	waived	waived	waived	waived	waived
SUBTOTAL	$241.6	$252.1	$273.9	$269.2	$264.3	$1,301.1
General Administration (9% of subtotal)	$21.7	$22.7	$24.7	$24.2	$23.8	$117.1
PROJECT TOTAL	$263.3	$274.7	$298.6	$293.4	$288.1	$1,418.2
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: PWSSC proposes a flat rate in lieu of its federal recognized IDC rate. This $200K itemized budget includes expenses that would normally be charged to IDC, and ALSO INCLUDES travel and meeting setup costs that are direct program charges.

FY12-16

Program Title: Administration and Meeting Travel/Logistics
Team Leader: Bird

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$10.0	$0.0	$0.0	$0.0	$0.0	$10.0
Contractual	$141.9	$0.0	$0.0	$0.0	$0.0	$141.9
Commodities	$35.5	$0.0	$0.0	$0.0	$0.0	$35.5
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$187.4	$0.0	$0.0	$0.0	$0.0	$187.4
General Administration (9% of subtotal)	$16.9	$0.0	$0.0	$0.0	$0.0	$16.9
PROJECT TOTAL	$204.2	$0.0	$0.0	$0.0	$0.0	$204.2
Other Resources (Cost Share Funds)		$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: NOTE!!!! One year of capture/sampling is planned for harlequin ducks (HADU) and one year for sea otters (SEOT). HADU capture year depends on sample analysis currently in progress, so work will be conducted in 2012 OR in 2013. We're adding values to this budget worksheet for only 1 year (2012), but work might end up being conducted in a different year (2013). SEOT capture dates are not anticipated to vary from planned.
Cost Share Funds include (a) USGS staff for sea otter capture logistics, capture, sample prep and shipping, and data analysis: approximately 70K; (b) USGS equipment for sea otter captures, and (c) USGS laboratory facilities for EROD and gene expression analyses. Donated funds include the sea otter veterinarian's time (travel and supplies will be covered under this project).

FY12-16

Program Title: HADU & SEOT Lingering Oil
Team Leader: Esler & Ballachey
Agency: USGS

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Contractual	$1.5	$1.5	$4.2	$1.5	$1.5	$10.2
Commodities	$14.0	$9.0	$130.0	$5.5	$4.0	$162.5
Equipment	$2.5	$1.5	$21.0	$1.0	$0.5	$26.5
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
SUBTOTAL	$18.0	$12.0	$155.2	$8.0	$6.0	$199.2
General Administration (9% of subtotal)	$1.6	$1.1	$14.0	$0.7	$0.5	$17.9
PROJECT TOTAL	$19.6	$13.1	$169.2	$8.7	$6.5	$217.1
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

COMMENTS: Portions of permanent staff salaries will be donated, including Dr. Jeep Rice, Mark Carls, Marie Larsen, Larry Holland, Josie Lunasin, and Mandy Lindeberg

FY12-16

Program Title: Carls
Team Leader:

SUMMARY