

Exxon Valdez Oil Spill Trustee Council



FINAL Work Plan for Federal Fiscal Year 2011

Issued February 26, 2014



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FISCAL YEAR 2011

DRAFT WORK PLAN

February 26, 2014

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Exxon Valdez Oil Spill Trustee Council

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Notice

The abstract of each proposal was written by the authors of the proposals to describe their projects. To the extent that the abstracts express opinions about the status of injured resources they do not represent the views of the Executive Director or other staff of the *Exxon Valdez* Oil Spill Trustee Council, nor do they reflect policies or positions of the Trustee Council.

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New Projects in FY11

| Project Number | Principal Investigator | Project Title (abbr.) | FY11 Funding | FY12 Funding | FY13 Funding | FY14 Funding | FY15 Funding | FY16 Funding |
|--|-------------------------------|---|-----------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| 11100836 | Boufadel | Bioremediation Pilot Studies | \$2,786,003.20 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |
| 11100808 | Esler | Nearshore Synthesis - Harlequin Duck Sampling | \$103,200.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |
| 11100100 | EVOS Administration | EVOS Administration | \$1,834,123.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |
| 11100853 | Irons | Pigeon Guillemot Restoration in PWS | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |
| 11100112 | Irvine | Lingering Oil on Boulder-Armored Beaches | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |
| FY11 New Project Funding Totals | | | \$4,723,326.20 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 |

Continuing Projects in FY11

| Project # | Principal Investigator | Project Title (abbr.) | FY11 Funding | First Year Funded |
|--|------------------------|--|-----------------------|-------------------|
| 10100132-G | Bishop | PWS Herring Survey: Top-Down Regulation by Predatory Fish | \$183,300.00 | FY10 |
| 10100750 | Bodkin | Evaluation of Recovery and Restoration of Injured Nearshore Resources | \$166,419.00 | FY10 |
| 10100132-F | Brown | PWS Herring Survey: Herring, Predator, and Competitor Density | \$153,055.60 | FY10 |
| 10100624 | Bychkov | Measuring Interannual Variability in the Herring's Forage Base | \$63,600.00 | FY10 |
| 10100132-A | Campbell | PWS Herring Survey: Plankton and Oceanographic Observations | \$197,300.00 | FY10 |
| 10100290 | Carls | The Exxon Valdez Trustee Hydrocarbon Database | \$9,300.00 | FY10 |
| 10100132-E | Gay | PWS Herring Survey: Nursery Habitats of Juvenile Pacific Herring | \$83,100.00 | FY10 |
| 10100132-D | Heintz | PWS Herring Survey: Predictors of Winter Performance | \$99,000.00 | FY10 |
| 10100132-I | Hershberger | PWS Herring Survey: Herring Disease Program (HDP) | \$284,100.00 | FY10 |
| 10100839 | Hollmen | Evaluating Injury to Harlequin Ducks - Amendment | \$32,400.00 | FY10 |
| 10100751 | Irons | Prince William Sound Marine Bird Surveys, Synthesis and Restoration | \$39,240.00 | FY10 |
| 10100132-C | Kline | PWS Herring Survey: Pacific Herring Energetic Recruitment Factors | \$256,600.00 | FY10 |
| 10100132-H | Kuletz | PWS Herring Survey: Seasonal & Interannual Trends in Seabird Predation | \$163,900.00 | FY10 |
| 10100574 | Lees | Re-Assessment of Bivalve Recovery | \$95,400.00 | FY10 |
| 10100742 | Matkin | Killer Whales in Prince William Sound/Kenai Fjords | \$132,309.70 | FY10 |
| 10100132 | Pegau | PWS Herring Survey: Comm. Involvem., Outreach, Logistics, & Synthesis | \$385,600.00 | FY10 |
| 10100128 | Quinn | Historical Humpback Whale Abundance | \$69,500.00 | FY10 |
| 10100132-B | Thorne | PWS Herring Survey: Assessment of Juvenile Herring Abundance | \$196,700.00 | FY10 |
| 10100340 | Weingartner | Long-Term Monitoring of the Alaska Coastal Current | \$138,700.00 | FY10 |
| FY11 Continuing Project Funding Total | | | \$2,749,524.30 | |

Descriptions of New and Continuing Projects in FY11

Project Number: 10100132-G
Project Title: PWS Herring Survey: Top-Down Regulation by Predatory Fish on Juvenile Herring
Principal Investigator: Mary Anne Bishop
Affiliation: Prince William Sound Science Center
Co-PIs/Personnel: Sean Powers
Disbursing Agency: NOAA
Project Location: Prince William Sound
Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------------|---------------------------|
| FY10: \$185,500.00 | FY11: \$183,300.00 | FY12: \$193,400.00 |
| FY13: \$116,700.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$678,900.00

Abstract:

Based on population trends, the Prince William Sound (PWS) Pacific herring population does not show signs of recovering. Predation pressure on juvenile herring has been cited as an important factor in preventing recovery. Juvenile herring are heavily preyed upon by multiple species of fish, including rockfish, a species group injured by the Exxon Valdez Oil spill with unknown recovery status. This proposal is for a four-year study to investigate fish predation on the 0-age class herring over winter, a critical bottleneck for recruitment. We will examine the spatial and temporal abundance of fish predators in and around juvenile herring schools, as well as the physical and biological characteristics of the herring schools on which they feed. We will also conduct laboratory experiments to determine fish predators' daily rations and prey preferences. Our project is a component of the PWS Herring Survey program and relies on predator surveys being performed on integrated November and March cruises. Our models will provide estimates of juvenile herring consumption by the most important fish predators. Ultimately, this study will improve understanding of the role of fish predation on herring recruitment, will provide protocols and recommendations for long-term fish predator monitoring and management, and will help to identify candidate sites for herring supplementation efforts.

Science Panel Comments:

Predation has been identified as a significant constraint to the recovery of herring in PWS. The Trustees have recently funded two projects investigating the impact of seabird and whale predation on herring. This study will provide a more complete picture of the role predation plays in the herring lifecycle by determining the influence of fish predators.

Science Panel Recommendation: Fund

Science Coordinator Comments:

The effects of predatory fish on herring have not been studied even though it has been identified as a potential limiting factor for the restoration of herring. The data collected in this project will further our understanding of the impact of this type of predation and will give a deeper understanding of herring's lack of recovery.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Possible reduction as a function of the recommended overall 10% decrease of the 10100132 PWS Herring Survey - see 10100132.

Public Advisory Committee Recommendation: Fund Reduced

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100750
Project Title: Monitoring for Evaluation of Recovery and Restoration of Injured Nearshore Resources
Principal Investigator: James Bodkin
Affiliation: US Geological Survey
Co-PIs/Personnel: Tom Dean
Disbursing Agency: USGS
Project Location: Western Prince William Sound
Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------------|---------------------------|
| FY10: \$187,129.00 | FY11: \$166,419.00 | FY12: \$165,329.00 |
| FY13: \$103,411.60 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$622,288.60

Abstract:

The proposed project is designed to assist in the evaluation of recovery and restoration of injured resources in Prince William Sound. The primary objective is to initiate or continue recovery and restoration monitoring in the nearshore in Prince William Sound following the plan developed in Restoration Project 050750 and tested in Restoration Project 070750. The goal of this program is to 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 factors limiting recovery. The National Park Service and USGS began implementation of a similar nearshore monitoring plan outside of Prince William Sound (i.e., along the Katmai, Kenai Fjords, and Lake Clark National Park coasts, including both oiled and unoled sites) in 2006. This program is collecting information similar to the data sets that have been used to assess recovery of injured resources in Prince William Sound (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). Contrasts among trends in injured resources in and outside Prince William Sound, including both oiled and unoled areas will provide the primary means of resource evaluation. Funds for conducting some of these studies in Prince William Sound (e.g., bird and mammal surveys, D. Irons USFWS) are being sought by other proposals submitted to the Trustee Council and are not addressed herein. Our purpose is to implement a nearshore monitoring program in Western Prince William Sound related to EVOS injured resources and to make it comparable to the program being carried out by the National Park Service in the Gulf of Alaska outside of Prince William Sound. This proposed nearshore sampling in Prince William Sound, in conjunction with nearshore sampling and data management supported by NPS and USGS will provide the foundation of a comprehensive restoration monitoring program for the entire oil spill area.

Science Panel Comments:

This proposal provides a logical next step in development of a program to determine long-term health of the intertidal community and associated resources that were clearly impacted by the spill. It specifically addresses recovery status of injured intertidal communities for which little current information is available. The proposal builds on work funded by other agencies to provide an important gulf-wide perspective.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Available

Public Advisory Committee Recommendation: Fund

Executive Director Comments:

Not Available

Executive Director Recommendation: Priority Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100132-F

Project Title: PWS Herring Survey: Sound Wide Juvenile Herring, Predator, and Competitor Density via Aerial Surveys, submitted under the BAA AB133F-09-RP-0059

Principal Investigator: Evelyn Brown

Affiliation: Flying Fish Ltd.

Co-PIs/Personnel: None

Disbursing Agency: NOAA

Project Location: PWS

Project Type: Continuing

Funding Approved by Fiscal Year:

FY10: \$160,140.60

FY11: \$153,055.60

FY12: \$153,055.60

FY13: \$35,001.00

FY14: \$0.00

FY15: \$0.00

Total Funding Approved: \$501,252.80

Abstract:

As a component of the integrated PWS Herring Survey (Pegau, P.I.), this project provides 1) a sound-wide, spatially-explicit map of juvenile herring densities, 2) synoptic distributions of herring predator and competitors, and 3) builds on 5 years of previous PWS surveys. June-August surveys map age 1 overwinter survivorship, the timing, spatial extent, and density of age 0 recruiting to nursery habitat, summer mortality of age 1 herring, as well as associated changes in predator/competitor densities. Validation sampling will be provided by a shared vessel with the PWS Herring Survey monthly zooplankton cruises (Campbell, P.I.). Combined with data from other projects within and outside of the PWS Herring Survey, this project's data provides 1) inputs, outputs, and validation for overwinter survival and density-dependent models of predation, growth and disease, 2) an initial estimate of age 2 immature herring recruitment, and 3) spatial information needed to plan, initiate, and evaluate intervention actions.

Science Panel Comments:

The objectives, while good, are probably not achievable with the proposed level of effort suggested. Consequently the results could fall short of the objectives. Regardless some of the results could be very useful, even with inherent limitations. The main technical issues noted by the panel concern species identification from the air: it is not sufficient that the observer is convinced of the species identity – there must be a validation process that is transparent and convincing. Some form of ground-truthing is required. The Science panel also wondered about limitation of quantitative estimates of fish schools and why there was no explicit reference to analysis of photographic records. Although the Science panel was highly skeptical of many of the claims made in the proposal it recognized that interest and dedication of the researchers, and acknowledges that areal work could provide a valuable support for the herring Survey team. Therefore the recommendation was to fund the project for one year and re-evaluate the proposal before further support.

Science Panel Recommendation: Fund Reduced

Science Coordinator Comments:

While I concur with several of the science panel's comments on this project, I do believe that this work will provide valuable data for the Council's herring restoration efforts. The researcher is experienced in this type of data collection and will be coordinating closely with the other members of the PWS Herring Survey team to ground-truth the aerial observations.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Possible reduction as a function of the recommended overall 10% decrease of the 10100132 PWS Herring Survey - see 10100132.

Public Advisory Committee Recommendation: Fund Reduced

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100624

Project Title: Measuring Interannual Variability in the Herring's Forage Base from the GOA - Submitted Under the BAA

Principal Investigator: Alexander Bychkov

Affiliation: PICES

Co-PIs/Personnel: Sonia Batten

Disbursing Agency: NOAA

Project Location: Shelf waters SW of PWS, Cook Inlet, northern GOA

Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|--------------------------|--------------------------|--------------------------|
| FY10: \$61,900.00 | FY11: \$63,600.00 | FY12: \$65,100.00 |
| FY13: \$15,000.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$205,600.00

Abstract:

Herring from Prince William Sound feed on zooplankton, some originating within the Sound and some from the Gulf of Alaska (GOA) introduced to PWS via a variety of processes. Additionally, adult herring almost certainly forage outside of the Sound, feeding on zooplankton over the wider Alaskan shelf. Understanding the sources of variability in the herring forage base is essential to efforts to understand the herring recovery process and to address basic resource management questions. Direct measurements inside PWS do not explain how the interannual variation in ocean food sources creates interannual variability in PWS zooplankton, nor when changes in ocean zooplankton are to be seen inside PWS. A ten-year time series of seasonal zooplankton data from the Alaskan shelf and northern oceanic GOA has been maintained through support from a variety of agencies including the EVOS TC. The Continuous Plankton Recorder (CPR) survey is a cost-effective, ship-of-opportunity based sampling program that includes community involvement and has a proven track record. The existing time series shows considerable interannual variation in GOA zooplankton abundance and is essential baseline data to underpin herring restoration efforts. EVOS TC support is now requested to maintain the sampling in this region at the current resolution while we examine the linkages between PWS and GOA zooplankton.

Science Panel Comments:

This project provides the only long-term record of plankton abundance and species composition important to understanding the inter-annual variation in herring food from the Gulf of Alaska. This information is necessary to understand herring mortality and long-term trends in herring abundance. The proposers are global leaders in the field and have successfully maintained a time series of such information for a decade using a consortium of funders, including the EVOSTC. The approach using vessels of opportunity and continuous plankton recorders has provided information of the highest quality for the lowest costs for over 50 years. This is the longest plankton time series in the Pacific.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Available

Public Advisory Committee Recommendation: Fund

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100132-A

Project Title: PWS Herring Survey: Plankton and Oceanographic Observations, Submitted Under the BAA

Principal Investigator: Robert Campbell

Affiliation: Prince William Sound Science Center

Co-PIs/Personnel: None

Disbursing Agency: NOAA

Project Location: Prince William Sound

Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------------|---------------------------|
| FY10: \$201,500.00 | FY11: \$197,300.00 | FY12: \$200,100.00 |
| FY13: \$64,400.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$663,300.00

Abstract:

Herring stocks collapsed in the years following the Exxon Valdez Oil Spill. The cause of the collapse remains highly controversial, and several empirical and theoretical studies have implicated different factors, including the spill, disease outbreaks, fishing activity, and ecosystem productivity. Herring stocks have not rebounded since the collapse in the early 90's and show no signs of recovery; similarly controversial, varied, and not necessarily mutually exclusive. The work described in this proposal is part of several collaborative proposals to survey herring in PWS, and seeks to monitor the environmental and food climate experienced by herring in order to address the hypothesis that carrying capacity can be limiting the recovery of herring. Observations of environmental conditions and plankton abundance over time will be integrated with observations of herring distributions and energetics, in order to assess how the food climate in Prince William Sound may structure herring populations in space and time.

Science Panel Comments:

The science panel endorsed this project because it addressed fundamental issues related to the role of food availability and the decline or lack of recovery of herring. Food limitation over the winter is seen to be a credible explanation as a factor affecting the survival of age 0+ herring over the winter. This project will address a basic part of the hypothesis. The work also could have implications for factors affecting other species, including competitors and predators of herring. The reviews were positive and the PI appears to be productive. Also the proposal is connected and coordinated with other concurrent projects in the herring survey.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Possible reduction as a function of the recommended overall 10% decrease of the 10100132 PWS Herring Survey - see 10100132.

Public Advisory Committee Recommendation: Fund Reduced

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100290
Project Title: The Exxon Valdez Trustee Hydrocarbon Database
Principal Investigator: Mark Carls
Affiliation: NOAA/NMFS Auke Bay Laboratory
Co-PIs/Personnel: Marie Larsen
Disbursing Agency: NOAA
Project Location: Auke Bay Laboratories – TSMRI, Juneau, AK
Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|-------------------------|-------------------------|-------------------------|
| FY10: \$9,300.00 | FY11: \$9,300.00 | FY12: \$9,300.00 |
| FY13: \$9,300.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$37,200.00

Abstract:

This is an on-going service project that provides data and sample archiving services for all samples collected for hydrocarbon analysis in support of Exxon Valdez Oil Spill Trustee Council projects. These data represent samples collected since the oil spill in 1989 to the present and include National Resource Damage Assessment (NRDA) studies (environmental and laboratory) and Restoration and Recovery data. This project serves as an archive for chemical analyses and sample data and storage of physical samples that have not been analyzed and provides copies of the ACCESS database to interested parties. The project also responds to several Freedom of Information Act (FOIA) requests each year for information associated with these data. Interpretative services for these data are available.

Science Panel Comments:

This proposal provides ongoing support for maintaining, updating, and serving hydrocarbon data that are critical to future evaluations of recovery and restoration.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Available

Public Advisory Committee Recommendation: Fund

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100132-E

Project Title: PWS Herring Survey: Physical Oceanographic Characteristics of Nursery Habitats of Juvenile Pacific Herring, submitted under the BAA AB133F-09-RP-0059

Principal Investigator: Shelton Gay

Affiliation: Prince William Sound Science Center

Co-PIs/Personnel: None

Disbursing Agency: NOAA

Project Location: Prince William Sound, Alaska

Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|--------------------------|--------------------------|--------------------------|
| FY10: \$88,400.00 | FY11: \$83,100.00 | FY12: \$90,000.00 |
| FY13: \$91,500.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$353,000.00

Abstract:

The objectives of this research are to build upon a physical oceanographic data base started during the SEA project and continued under a recent EVOS funded project: Physical Oceanographic Factors Affecting Productivity in Juvenile Pacific Herring Nursery Habitats. The rationale of this project is based upon past research of juvenile Pacific herring in PWS, which has shown that recruitment is highly influenced by conditions within nursery sites affecting survival within the first year. Important among these conditions is the pre-winter condition of juvenile (age-0) herring and the effects of water temperatures on metabolism and hence over-winter survival. Past studies of the physical oceanography of nursery fjords has indicated that each site has a unique set of hydrographic conditions that are influenced by both local processes and water exchange between the GOA and PWS. These factors vary significantly depending on geographic location, basin morphometry, watershed topography and proximity to tidewater glacial fjords. The proposed study will continue monitoring the physical properties within the four SEA nursery fjords and additional sites as determined by future herring surveys, and collect time-series data on temperature, salinity and fluorescence to determine the variation among nurseries in factors such as ocean climate, stratification, mixing, phytoplankton biomass, and energy constraints imposed on juvenile herring by seasonal changes in water temperatures. The data will also assist in evaluating potential sites for future supplementation efforts in restoring the herring population.

Science Panel Comments:

This project will continue to make key hydrographic and circulation measurements in PWS. Such measurements are critical to other studies, like that of Kline, and to constructing a synthetic population model for herring.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Possible reduction as a function of the recommended overall 10% decrease of the 10100132 PWS Herring Survey -

see 10100132.

Public Advisory Committee Recommendation: Fund Reduced

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100132-D

Project Title: PWS Herring Survey: Value of Growth and Energy Storage as Predictors of Winter Performance in YOY Herring from PWS

Principal Investigator: Ronald Heintz

Affiliation: NOAA/NMFS Auke Bay Laboratory

Co-PIs/Personnel: JJ Vollenweider

Disbursing Agency: NOAA

Project Location: Eaglek, Simpson, Whale and Zaikof and other bays

Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|--------------------------|--------------------------|--------------------------|
| FY10: \$99,000.00 | FY11: \$99,000.00 | FY12: \$99,000.00 |
| FY13: \$9,600.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$306,600.00

Abstract:

This proposal examines the reliability of fall growth rates as an indicator of over-winter performance among YOY herring in Prince William Sound. The Trustee Integrated Herring Restoration Program cites the need for identifying parameters that reliably indicate condition. Parameters such as size or energy density can provide misleading results. While size is a good predictor of over-winter survival in a given year, there is no critical size that predicts survival across years. Similarly, changes in energy density may not reflect the severity of winter. We propose that fall growth rate predicts performance because herring acquire the bulk of their lipid in fall. Individuals experiencing high growth in fall are likely to obtain disproportionately large energy reserves. We propose using models relating RNA/DNA ratios to growth obtained under another Trustee study to estimate growth in field specimens collected during the survey period. In addition we will examine how energy is partitioned between structural and storage compartments. Combining these data with those of other projects being proposed under the PWS Herring Survey will allow us to test the hypothesis that growth in fall is the most consistent indicator of over winter survival because fall growth provides for the greatest provisions of stored energy.

Science Panel Comments:

The science panel noted concern that ongoing work by the PI should be brought to completion before starting a new project. Further there was concern that the proposed sample size was too small and not random enough to provide convincing results.

Science Panel Recommendation: Do Not Fund

Science Coordinator Comments:

This project will provide information that will be important in understanding over winter performance of young of the year herring in PWS.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Possible reduction as a function of the recommended overall 10% decrease of the 10100132 PWS Herring Survey - see 10100132.

Public Advisory Committee Recommendation: Fund Reduced

Executive Director Comments:

Not Available

Executive Director Recommendation: Do Not Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100132-I
Project Title: PWS Herring Survey: Herring Disease Program (HDP)
Principal Investigator: Paul Hershberger
Affiliation: US Geological Survey
Co-PIs/Personnel: Maureen Purcell, Jim Winton
Disbursing Agency: USGS
Project Location: Prince William Sound, Sitka Sound, Puget Sound, USGS - Marrowstone Marine Field Station
Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------------|---------------------------|
| FY10: \$81,800.00 | FY11: \$284,100.00 | FY12: \$295,800.00 |
| FY13: \$313,500.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$975,200.00

Abstract:

The Herring Disease Program (HDP) is part of a larger integrated effort, the PWS herring survey: Community Involvement, Outreach, Logistics, and Synthesis submitted under the BAA (outlined in a separated proposal by Dr. Scott Pegau), that is intended to identify juvenile rearing bays, measure factors limiting the success of juvenile herring, and provide recommendations for spatial and temporal coverage of future monitoring efforts. Within this integrated effort, the HDP is intended to evaluate the impact of infectious and parasitic diseases on the failed recovery of the PWS herring population by placing special emphasis on disease processes affecting juvenile cohorts. The framework for the 2010 - 2013 HDP involves a combination of field surveillance efforts and laboratory-based empirical disease process studies. Field surveillance efforts will provide continued and expanded infection and disease prevalence data for herring populations in Prince William Sound (PWS), Sitka Sound, and Puget Sound. Additionally, samples from field surveillance efforts will be processed using newly-developed disease forecasting tools to provide annual risk assessments that quantify the potential for future disease epizootics. Empirical disease process studies will provide an understanding of cause and effect epidemiological relationships between the host, pathogen, and environment; understanding of these relationships represents a first step towards developing additional disease forecasting tools. Specific emphasis will be placed on refining our understanding disease processes specific to viral hemorrhagic septicemia (VHS) and ichthyophoniiasis, two primary diseases of herring in PWS.

Science Panel Comments:

This proposal describes continuation of herring disease monitoring and research into its role in combination with other interacting stressors in suppressing herring recovery in PWS. This is done in coordination with the broader Herring Survey program proposed by Scott Pegau. Although a continuation of an ongoing project, this proposal clearly identifies a set of new objectives that are appropriate and compelling. Specifically, the laboratory experiments evaluating the cause-effect epidemiology of how host, parasite, and environmental factors interact to dictate disease impacts is especially promising. The survey work also focuses on disease effects on YOY herring in ways that may lead to much improved understanding of disease impacts on herring because of the complex role of historical exposure and immunity in determining impacts later in the life history. Hershberger and colleagues have been exceptionally productive in their past EVOS work. Although this project is expensive over its 4 years, the costs are appropriate for the type of research required, involving sophisticated lab assessments of multiple diseases.

The Science Panel recommends FUND – even if the entire Herring Survey is not funded or slow to be funded because this project can stand on its own merits (although needs field ship platforms for collections of herring).

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Possible reduction as a function of the recommended overall 10% decrease of the 10100132 PWS Herring Survey - see 10100132.

Public Advisory Committee Recommendation: Fund Reduced

Executive Director Comments:

Not Available

Executive Director Recommendation: Priority Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100839
Project Title: Evaluating Injury to Harlequin Ducks - Amendment
Principal Investigator: Tuula Hollmen
Affiliation: Alaska SeaLife Center
Co-PIs/Personnel: Kathrine Springman
Disbursing Agency: ADFG
Project Location: Prince William Sound
Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|--------------------------|---------------------|
| FY10: \$218,300.00 | FY11: \$32,400.00 | FY12: \$0.00 |
| FY13: \$0.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$250,700.00

Abstract:

Evaluation of harlequin duck (*Histrionicus histrionicus*) population trends, survival measures, and biomarker indicators of exposure suggests that the species is recovering, but has not fully recovered from the effects of the 1989 Exxon Valdez oil spill (EVOS) in the Prince William Sound (PWS). In areas oiled by the EVOS, elevated cytochrome P4501A biomarker induction has been observed in harlequin ducks as recently as March 2007, providing evidence of continued exposure. The magnitude of injury and its implications for populations of harlequin ducks caused by chronic oil exposure and long-term induction of central enzymatic processes is unknown. This study applies a panel of in vitro harlequin duck and surrogate cell line bioassays for a species-specific toxicological assessment of site-specific hydrocarbons from PWS. A combination of bioassays that measure direct effects on cell viability and DNA damage provide a new method to assess and quantify injury. Also, a battery of laboratory bioassays provides a method to link P4501A biomarker induction with other measures of cellular injury, and a comprehensive assessment of potential short- and long-term toxicity.

Science Panel Comments:

Not Applicable

Science Panel Recommendation: Not Reviewed

Science Coordinator Comments:

Not Applicable

Science Coordinator Recommendation: Not Reviewed

Public Advisory Committee Comments:

Not Applicable

Public Advisory Committee Recommendation: Not Reviewed

Executive Director Comments:

Not Available

Executive Director Recommendation: Priority Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100751
Project Title: Prince William Sound Marine Bird Surveys, Synthesis and Restoration
Principal Investigator: David Irons
Affiliation: U.S. Fish and Wildlife Service
Co-PIs/Personnel: Kathy Kuletz
Disbursing Agency: USFWS
Project Location: Prince William Sound
Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|--------------------------|---------------------|
| FY10: \$254,499.70 | FY11: \$39,240.00 | FY12: \$0.00 |
| FY13: \$0.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$293,739.70

Abstract:

We propose to conduct small boat surveys to monitor abundance of marine birds in Prince William Sound, Alaska, during March and July 2010. Ten 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 in 2010 to examine trends from summer and from winter 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 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 murrelets (*Uria lomvia*) 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. 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. A survey in 2010 would also benefit the ongoing Pigeon Guillemot Restoration Research Project by providing a Sound-wide pigeon guillemot population trend estimate through 2010, facilitating a comparison to the population trend on Naked Island.

Science Panel Comments:

The proposal is to continue one of the most valuable studies on long-term trends of marine populations in Prince William Sound. It includes multiple populations of sea birds as well as sea otters. The proposed work is a straightforward continuation of a well-proven and valuable survey method. Previous surveys have recently been conducted at about 3 year intervals. The P.I.s have used sophisticated statistical approaches to analyzing the data in various parts of PWS and reported their work in the scientific literature periodically. The project is cost-effective for the spatial and species extent for which data will be obtained.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Available

Public Advisory Committee Recommendation: Fund

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100132-C
Project Title: PWS Herring Survey: Pacific Herring Energetic Recruitment Factors
Principal Investigator: Thomas Kline
Affiliation: Prince William Sound Science Center
Co-PIs/Personnel: None
Disbursing Agency: NOAA
Project Location: Prince William Sound
Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------------|---------------------------|
| FY10: \$258,700.00 | FY11: \$256,600.00 | FY12: \$265,000.00 |
| FY13: \$218,300.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$998,600.00

Abstract:

This project is one component of the greater integrated study titled PWS herring survey: Community Involvement, Outreach, Logistics, and Synthesis (Pegau, P.I.). This proposed effort seeks to improve understanding of habitat utilization by juvenile herring, especially age 0, and to help identify candidate sites that could be potentially used for supplementation efforts. This particular proposal builds on 15 years of experience in assessment of juvenile herring in PWS using isotope and energetic techniques. We propose to measure energy levels of juvenile herring and other fishes in 8 juvenile herring nursery areas. Four of these areas, Simpson Bay, Eaglek Bay, Whale Bay and Zaikof Bay, were the focus of earlier investigation by the Sound Ecosystem Assessment (SEA) program in 1995-96 as well as a current Council-funded "PWS Herring Forage Contingency" project. Four additional sites will be selected based on historical data and community input and the 'blitz' sampling program. We propose to conduct surveys three times per year, pre- and post-winter and summer, for three years (including a planning year). The pre- and post-winter series will complement other studies that propose to examine overwinter change in energetics. The pre- and post-winter periods have been examined for the past three years. The summer period will provide a link between a more dispersed age 0 herring distribution following larvae drift and the subsequent overwintering locations. The fourth year of the project will focus on data analysis, synthesis and reporting.

Science Panel Comments:

The science panel recognized that although highly specialized, past work has made a substantial contribution to the scientific literature on herring in PWS and elsewhere. The reviews were positive and the only negative comment concerned the high costs of sample analysis. Now there is increasing recognition that herring research in PWS must be coordinated with other projects, both conceptually and operationally. The Science panel would have preferred to see how this proposal would be connected and integrated with other concurrent work.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Possible reduction as a function of the recommended overall 10% decrease of the 10100132 PWS Herring Survey - see 10100132.

Public Advisory Committee Recommendation: Fund Reduced

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100132-H

Project Title: PWS Herring Survey: Seasonal & Interannual Trends in Seabird Predation on Juvenile Herring

Principal Investigator: Katherine Kuletz

Affiliation: US Fish & Wildlife Service

Co-PIs/Personnel: Mary Anne Bishop

Disbursing Agency: USFWS

Project Location: Prince William Sound

Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------------|---------------------------|
| FY10: \$147,200.00 | FY11: \$163,900.00 | FY12: \$150,900.00 |
| FY13: \$102,900.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$564,900.00

Abstract:

Predation pressure on juvenile Pacific herring has been identified by the 2008 Integrated Herring Restoration Plan as one of five potential factors limiting recovery of Prince William Sound herring. Juvenile herring are heavily preyed upon by multiple species of seabirds, including six species initially injured by the Exxon Valdez oil spill and three species that have not yet recovered (Marbled Murrelet, Kittlitz's Murrelet and Pigeon Guillemot). This study will investigate the spatial and temporal abundance of seabird predators in and around juvenile herring schools during three time periods: August, November and March. We will also examine the physical and biological characteristics of the fish schools seabirds feed on. Our project is a component of the integrated, multi-project PWS Herring Survey program and relies on seabird surveys being performed on vessels associated with hydroacoustic juvenile herring surveys. Our bioenergetic models will provide estimates of juvenile herring consumption by the most important seabird predators, including inter- and intra-annual variability in consumption rates. This study will improve understanding of the role of seabird predation on herring recruitment and will help to identify candidate sites for herring supplementation efforts.

Science Panel Comments:

This study will investigate the spatial and temporal abundance of seabirds around juvenile herring schools during three time periods: August, November and March. It will also examine the physical and biological characteristics of the herring schools on which seabirds feed. This is a fairly well conceived and systematic approach to evaluating one source of predation pressure on Pacific herring. However, the project is strongly oriented towards herring as a source of nutrition for seabirds rather than as predators of herring. The most important objective of this study should be to quantify the amount of juvenile herring consumed by sea birds rather than the importance of herring to the diet of sea birds. Sea birds are likely important predators on juvenile herring, but it should not take 3 or 4 years to make a rough estimate of how important seabirds are as juvenile herring predators relative to other predators, i.e. marine mammals. A first order estimate might even be reasonably done with the data at hand.

Science Panel Recommendation: Do Not Fund

Science Coordinator Comments:

While I agree with some of the science panel's concerns, only five surveys have been completed to date and more data will be needed to make an educated estimate of the effect of seabird predation on herring. The addition of night surveys will allow the team to relate seabird densities concurrent with Dr. Richard Thorne's nighttime herring hydroacoustic surveys.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Possible reduction as a function of the recommended overall 10% decrease of the 10100132 PWS Herring Survey - see 10100132.

Public Advisory Committee Recommendation: Fund Reduced

Executive Director Comments:

Not Available

Executive Director Recommendation: Do Not Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100574

Project Title: Re-Assessment of Bivalve Recovery on Treated Mixed-Soft Beaches in Prince William Sound

Principal Investigator: Dennis Lees

Affiliation: Littoral Ecological & Environmental Services

Co-PIs/Personnel: None

Disbursing Agency: NOAA

Project Location: Prince William Sound, from Eleanor Island south to Latouche Island

Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|--------------------------|--------------------------|
| FY10: \$133,600.00 | FY11: \$95,400.00 | FY12: \$32,600.00 |
| FY13: \$0.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$261,600.00

Abstract:

Studies from 1989 through 1997 suggested that bivalve assemblages on beaches in Prince William Sound (PWS) treated with high-pressure hot-water washing remain damaged. An EVOS-funded study in 2002 confirmed this hypothesis; hardshell clams were only one-third as abundant at washed sites as at unwashed sites. Considering the importance of hardshell clams to sea otters, other nearshore predators, and humans, this finding is important.

Using information from 1989, we constructed a preliminary recovery trajectory. This model predicts that clam assemblages at washed sites in PWS will require more than five decades to recover. Subsequently, a less extensive study of clam assemblages in PWS and research in other areas suggest that hardshell clams may be experiencing recruitment failures throughout the Pacific Northwest. By re-evaluating the status of clam populations at 40 sites sampled in 2002, this project will provide insights into: 1) the recovery trajectory for PWS clam assemblages by adding a third point for abundance at washed sites; and 2) the generality of the hypothesis that hardshell clams are experiencing recruitment failures throughout the Pacific Northwest.

Science Panel Comments:

This proposal was responsive to the guidance of the science panel and trustee council staff. The addition of FitzGerald provides a geomorphologist of obvious experience with a sufficient level of effort in each year to have a good chance of developing a viable means of quantifying this difficult concept of armoring. I consider the increase of 23% in the budget to be appropriately defended and necessary. This proposal is now appropriate for funding and important because it will address an injured resource (Clams), update its recovery status, and develop geomorphological methods of measuring armoring.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel's recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

The PAC recommends this project for funding if the PI satisfactorily collaborates with Project 10100829 (Shigenaka) and if their combined effort does not exceed \$150,000 in FY10.

Public Advisory Committee Recommendation: Fund Contingent

Executive Director Comments:

Not Available

Executive Director Recommendation: Could Wait

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100742

Project Title: Monitoring, Tagging, Feeding Studies, and Restoration of Killer Whales in Prince William Sound/Kenai Fjords 2010-2012 Submitted under the BAA

Principal Investigator: Craig Matkin

Affiliation: North Gulf Oceanic Society

Co-PIs/Personnel: None

Disbursing Agency: NOAA

Project Location: Prince William Sound/ Kenai Fjords

Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------------|---------------------------|
| FY10: \$132,309.70 | FY11: \$132,309.70 | FY12: \$125,775.10 |
| FY13: \$0.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$390,394.50

Abstract:

The proposed project is a continuation of the monitoring of AB pod and the AT1 population killer whale populations in Prince William Sound. These groups of whales suffered serious losses at the time of the spill and have not recovered at projected rates. The project also extends the scope of the basic monitoring to include an innovative satellite tagging program to examine habitat preference and incorporates a more extensive examination of feeding habits using observational and chemical techniques. The project will delineate important habitat and variations in pod specific movements and feeding behavior within a temporal and geographic framework. Results will allow us to more closely examine the potential for restoration. The project will more clearly delineate the role of killer whales, both fish eating and mammal eating in the nearshore ecosystem and possible effects on the restoration recovery of harbor seals and sea otters. 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.

Science Panel Comments:

This proposal continues the monitoring of killer whales in PWS, focusing on the injured resident AB pod and the transient AT1 population. New tagging technologies and expanded temporal sampling into the winter help expand the understanding of recovery processes that will emerge from this work. Matkin's past performance on EVOS studies has been excellent and public and scientific interest is still intense. The top apex consumer of the entire coastal ecosystem can have dramatic impacts on the entire ecosystem so this study is central to a system-wide understanding of its status.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Available

Public Advisory Committee Recommendation: Fund

Executive Director Comments:

Not Available

Executive Director Recommendation: Priority Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100132

Project Title: PWS Herring Survey: Community Involvement, Outreach, Logistics, and Synthesis, Submitted Under the BAA

Principal Investigator: William Pegau

Affiliation: Prince William Sound Science Center

Co-PIs/Personnel: None

Disbursing Agency: NOAA

Project Location: Prince William Sound

Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------------|---------------------------|
| FY10: \$343,100.00 | FY11: \$385,600.00 | FY12: \$354,300.00 |
| FY13: \$97,400.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$1,180,400.00

Abstract:

This proposal contains the overview of a coordinated set of ten proposals from multiple organizations that are designed to address the Herring Surveys section of the Invitation for Proposals. It describes how individual components are being integrated to provide information needed to make informed decisions on herring restoration.

The objectives of the integrated herring survey program are:

- 1) Identify juvenile rearing bays for use in restoration planning.
- 2) Measure factors that may limit the success of herring recruitment including factors of oceanographic conditions, food availability, disease, overwinter energetics of juvenile herring, and predation.
- 3) Provide protocols and recommendations for spatial and temporal coverage of monitoring projects for potential inclusion in the core herring restoration effort.

This proposal describes the community involvement and outreach efforts, the integration of programs, sharing of logistics, and the responsibility for developing the final synthesized report.

Science Panel Comments:

Not Available

Science Panel Recommendation: Fund

Science Coordinator Comments:

This proposal will serve as the unifying point for the entire PWS Herring Survey team and will provide appropriate outreach to the spill-affected communities. Dr. Pegau will be responsible for synthesizing the nine scientific research projects completed as part of the herring survey, which will be critical in understanding the state of herring in the Sound and assisting the Council in determining next steps for herring restoration.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

The PAC recommended an overall 10% decrease in funding on the entire suite of 10100132 PWS Herring Survey proposals. This decrease would be determined by the team leader/synthesizer for this effort.

Public Advisory Committee Recommendation: Fund Reduced

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100128

Project Title: Historical Humpback Whale Abundance in Prince William Sound in Relation to Pacific Herring Dynamics

Principal Investigator: Terrance Quinn

Affiliation: University of Alaska Fairbanks

Co-PIs/Personnel: John Moran, Jan Straley, Olga Von Ziegesar-Matkin

Disbursing Agency: ADFG

Project Location: Prince William Sound

Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|--------------------------|--------------------------|---------------------|
| FY10: \$94,200.00 | FY11: \$69,500.00 | FY12: \$0.00 |
| FY13: \$0.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$163,700.00

Abstract:

The principal objective of this study is to analyze historical data on humpback whales to develop time series of abundance for humpback whales in Prince William Sound. This historical data is currently inaccessible, and has never been analyzed. Annual high-quality surveys used photoidentification, so that numbers were counted accurately. In this proposal, a relative index will be calculated from sightings and sampling effort. Mark-recapture models will be developed from sighting histories. These data will be used in an age-structured assessment model of Pacific herring to estimate the historical effect of whale predation on herring, leading to Suzie Teerlink's Master's thesis and three journal articles. This project is an offshoot from Project 090804, Rice's Significance of Whale Predation on Natural Mortality Rates of Pacific Herring in PWS, and will give a 30 year perspective to the findings of that project. This study develops a historical perspective to provide a better framework for understanding herring recovery. No field work is required for this data salvage project.

Science Panel Comments:

This project is an outgrowth of the Rice study over the past 2-3 years on the role of whale predation on herring. This study is exciting, novel, and important to the critical goal of evaluating the temporally changing role of humpback whale feeding on herring and its potential to suppress herring recovery. The PI joins with a co-PI from the Eye of the Whale Society to mine 30 years of past photo surveys of humpback whales in PWS to determine how whale abundance in the sound have changed during this periods. Overall, the north Pacific population of humpbacks has grown at about 6-7% annually during this period of international collaboration on whale conservation. How closely whale numbers in PWS follow the regional trend can be determined from the careful records from Eye of the Whale because each whale has individual markings and all sighting were photographically documented. This permits clever use of mark-recapture methods developed from small mammal trapping to be applied to the whale re-sighting data to estimate population numbers. The surveys done over the 30-year period by the society involved careful repetition of methods and terrific documentation, allowing corrections for changing survey effort. Once this project completes the annual estimation of whale abundances in PWS, it will then combine those numbers with feeding rate information from the Rice study just ending to construct a population dynamics model for Pacific herring to evaluate the potential role of growing humpback numbers on herring dynamics and recovery potential. The Science Panel considers this a necessary part of the herring monitoring program and an important contribution to developing herring recovery strategies.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Available

Public Advisory Committee Recommendation: Fund

Executive Director Comments:

Not Available

Executive Director Recommendation: Could Wait

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100132-B

Project Title: PWS Herring Survey: Assessment of Juvenile Herring Abundance and Habitat Utilization, Submitted Under the BAA

Principal Investigator: Richard Thorne

Affiliation: Prince William Sound Science Center

Co-PIs/Personnel: None

Disbursing Agency: NOAA

Project Location: Prince William Sound

Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------------|---------------------------|
| FY10: \$170,200.00 | FY11: \$196,700.00 | FY12: \$173,600.00 |
| FY13: \$56,200.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$596,700.00

Abstract:

The objectives of the proposed effort are to improve understanding of habitat utilization by juvenile herring, especially age 0, and to help identify candidate sites that could be potentially used for supplementation efforts. The proposal builds on three years of experience in assessment of juvenile herring in PWS using hydroacoustic techniques. We proposed to measure juvenile herring and other fish abundance in several potential juvenile herring nursery areas. Four of these areas, Simpson Bay, Eaglek Bay, Whale Bay and Zaikof Bay, were the focus of earlier investigation by the SEA program in 1995-96 as well as a current Council-funded project, "Trends in adult and juvenile herring distribution and abundance in Prince William Sound". Additional sites will be selected based on historical data and community input. We propose to conduct surveys three times per year: pre- and post-winter and summer. The pre- and post-winter series will complement other studies that propose to examine overwinter mortality, including energetics. The pre- and post-winter periods have been examined for the past three years. The summer period will provide a link between a more dispersed age 0 herring distribution following larvae drift and the subsequent overwintering locations. In addition, a 4-day survey of adult herring will be conducted in conjunction with the post-winter juvenile survey. This project will provide essential data on the distribution and abundance of juvenile herring and their competitors and predators. It will also assist development of a "Core Data Collection" program. The project is one part of a collaborative program for PWS herring surveys coordinated through the Prince William Sound Science Center.

Science Panel Comments:

This proposal represents a continuation of basic acoustic survey work for herring in PWS. The reviews were positive with the only concern mentioned was that the work had developed into a monitoring exercise and not a test of hypotheses. Indeed, past work has provided support for ADFG assessment work, but there also are a number of peer-reviewed scientific papers that have developed from this work. The Science panel noted that this proposal supports several other projects in the herring survey Team proposal. The Science panel also recognized the cooperative work with the ADFG and the solid publication record from previous work.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Possible reduction as a function of the recommended overall 10% decrease of the 10100132 PWS Herring Survey - see 10100132.

Public Advisory Committee Recommendation: Fund Reduced

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100340
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Principal Investigator: Thomas Weingartner
Affiliation: University of Alaska Fairbanks
Co-PIs/Personnel: None
Disbursing Agency: ADFG
Project Location: Gulf of Alaska
Project Type: Continuing

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------------|---------------------------|
| FY10: \$141,500.00 | FY11: \$138,700.00 | FY12: \$133,600.00 |
| FY13: \$0.00 | FY14: \$0.00 | FY15: \$0.00 |

Total Funding Approved: \$413,800.00

Abstract:

This program continues a 39-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 - 7 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 five important Alaska Coastal Current ecosystem parameters and to quantify and 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
5. Atmosphere-ocean heat fluxes.

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.

Science Panel Comments:

The proposal was extremely well written and clearly outlined the historical importance of the GAK1 line that has provided basic oceanographic observations (temperature and salinity) for three decades. In addition, the proposal clearly states how these data are critical to restoration. The proposal seeks continued funding for the GAK1 line and includes funds for addition of nitrate and fluorescence sensors at that site. The continued funding of GAK1 is critical to understanding the oceanographic environment, its influence on biological resources over time, recovery of injured resources, and potential restoration activities. No specific changes to the project were recommended, although access to more recent data through the website would be helpful. Currently only summaries of data obtained after 2006 are available. A more synthetic analysis of current GAK1 data and those obtained from elsewhere (e.g. as part of herring or nearshore projects) would also be welcomed in future proposals.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel recommendation.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Available

Public Advisory Committee Recommendation: Fund

Executive Director Comments:

Not Available

Executive Director Recommendation: Priority Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 11100836

Project Title: Pilot studies of bioremediation of the Exxon Valdez oil in Prince William Sound Beaches

Principal Investigator: Michel Boufadel

Affiliation: Not Available

Co-PIs/Personnel: Jacqui Michel

Disbursing Agency: NOAA

Project Location: Prince William Sound

Project Type: New

Funding Approved by Fiscal Year:

| | | |
|-----------------------------|---------------------|---------------------|
| FY11: \$2,786,003.20 | FY12: \$0.00 | FY13: \$0.00 |
| FY14: \$0.00 | FY15: \$0.00 | FY16: \$0.00 |

Total Funding Approved: \$2,786,003.20

Abstract:

Oil from the Exxon Valdez persists on initially polluted beaches and contains a considerable fraction of the toxic compounds polycyclic aromatic hydrocarbons (PAHs). The results of the "Oil biodegradation" project by Albert Venosa revealed that more than 80% of the total PAHs (TPAHs) biodegrade within six months when exposed to an environment rich with dissolved oxygen and nutrients. Results from the "Limiting factors" project by Michel Boufadel revealed that the nutrient concentration was an order of magnitude lower than needed for optimal oil biodegradation. It was also found that the dissolved oxygen concentration at oiled pits was, in general, less than 1.0 mg/L. Therefore, anoxic conditions exist, which means that aerobic biodegradation of oil is not occurring. Therefore, both oxygen and nutrient limitations are occurring. While the Venosa study demonstrated oil biodegradability, the actual rate of oil biodegradation in the field when provided with sufficient oxygen and nutrient can be evaluated only through a pilot study of bioremediation, as we are proposing herein. Due to the high dilution for chemicals applied onto the beach surface, we evaluated the delivery of oxygen and nutrient solutions into the beaches subsurface through tracer studies. The tracer experiments revealed that the tracer delivered into the subsurface travelled distances of meters with minimal dilution. Therefore, we are proposing herein to pursue the same approach for delivering solutions of hydrogen peroxide, sodium nitrate, and sodium tripolyphosphate. Sediment samples will be obtained at various times from various locations and will be analyzed for oil composition. Surrogate measures for oil biodegradation include microbial population and the nutrient concentration. The selection of the beaches for the study will be made based on the "Limiting Factor project" and the "Spatial oil distribution" project by Jacqui Michel. Findings from the latter project will be relied upon to upscale the pilot scale results of this study.

Science Panel Comments:

This proposal represents a request to conduct a pilot remediation of persistently oiled shorelines, using key scientific information arising from the revealing studies conducted in their previous EVOS trustee-funded project. The approach involves injection of an oxygen source (hydrogen peroxide) and a source of inorganic nitrogen nutrient (Li nitrate) into the oiled subsurface layer at a position on the intertidal beach known from the earlier scientific work to result in transport to the oiled sediments down-shore. This method is based upon their clear demonstration of the role of oxygen limitation, nutrient limitation, and the importance and nature of sub-surface flows in the previous research phase of their EVOS work.

The funds requested for this project are high (1.6 M). The high costs are justified adequately by the budgetary information that is provided, although I do note what appears to be a high overhead rate for one of the consultancies. The remediation process being tested is directly applicable to the most troublesome type of beach where unweathered oil still persists two decades after the EVOS. The approach is relatively non-invasive, requiring only an injection

excavation high on the beach and monitoring wells and ports at a few locations lower on shore. The proposal includes exceptionally experienced and technically trained experts in all the necessary disciplines to complete the project with skill and insight. Boufadel, Michel, Wrenn, Short, and Crodes have complementary skills and have shown evidence of past effective collaboration to integrate their efforts successfully. The review of the large number of publications from the previous EVOS science project supports the conclusion that the knowledge of what limits degradation of the lingering oil is sufficient now to move ahead with this set of remediation trials.

This project is exceptional in its quality, technical expertise, importance, and potential to address a huge lingering impact of EVOS. Funding for this project is supported without reservation. It would be beneficial if there was some projection of costs of actually applying this remediation technique to all the known sites of concern. There is also some question of whether doing quantitative qPCR is justified because it provides molecular biological information on the biodiversity of hydrocarbon-degrading microbes but does not quantify them like more traditional measures of microbial biomass and degradation activity. If inadequately justified, that could save costs because this is an expensive process. This is a superb proposal, technically sound, well justified, and potentially providing a solution to the perhaps most nagging unsolved problem left by EVOS.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel's review and recommend funding for this project with no reservations.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Applicable

Public Advisory Committee Recommendation: Not Reviewed

Executive Director Comments:

I recommend funding the Boufadel project. However, I would like the PI to respond with regard to alternatives to the high overhead rate identified by the science panel comments.

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 11100808
Project Title: Nearshore Synthesis - Harlequin Duck Sampling
Principal Investigator: Daniel Esler
Affiliation: Not Available
Co-PIs/Personnel: None
Disbursing Agency: USGS
Project Location: Prince William Sound
Project Type: New

Funding Approved by Fiscal Year:

| | | |
|---------------------------|---------------------|---------------------|
| FY11: \$103,200.00 | FY12: \$0.00 | FY13: \$0.00 |
| FY14: \$0.00 | FY15: \$0.00 | FY16: \$0.00 |

Total Funding Approved: \$103,200.00

Abstract:

As part of EVOSTC restoration project 070808, harlequin ducks (along with other nearshore vertebrates) were examined for lingering exposure to residual Exxon Valdez oil. This work determined that harlequin ducks in oiled areas of PWS continued to show biomarker evidence of elevation of cytochrome P4501A through 2009, which was interpreted to indicate exposure to Exxon Valdez oil up to 20 years after the spill (Esler et al. 2010). In this amendment, I am requesting additional funding to replicate the harlequin duck sampling in March 2011 and conduct laboratory analyses, to continue to track the timeline over which exposure is indicated. This information will be used to gauge the status of recovery of harlequin ducks from the 1989 spill.

Science Panel Comments:

Not Applicable

Science Panel Recommendation: Not Reviewed

Science Coordinator Comments:

Not Available

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Applicable

Public Advisory Committee Recommendation: Not Reviewed

Executive Director Comments:

Not Available

Executive Director Recommendation: Not Available

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 11100100
Project Title: EVOS Administration
Principal Investigator: EVOS Administration
Affiliation: EVOSTC
Co-PIs/Personnel: None
Disbursing Agency: ADFG
Project Location: EVOSTC Office
Project Type: New

Funding Approved by Fiscal Year:

| | | |
|-----------------------------|---------------------|---------------------|
| FY11: \$1,834,123.00 | FY12: \$0.00 | FY13: \$0.00 |
| FY14: \$0.00 | FY15: \$0.00 | FY16: \$0.00 |

Total Funding Approved: \$1,834,123.00

Abstract:

The budget structure is designed to provide a clearly identifiable allocation of the funds supporting Trustee Council activities. The program components are:

- Administration Management
- Data Management
- Science Management
- Public Advisory Committee (PAC)
- Habitat Protection Program
- Trustee Council Member Direct Expenses
- Liaison Program Support/Project Management
- Alaska Resources Library & Information Services (ARLIS)

The budget estimates detailed within those specified program components are projected based upon prior year actual expenditures and include the application of estimated merit step increases, as well as payroll benefits increases. Detailed budget component items are either “continuing” or “ongoing” from program directives already approved by the Trustee Council and cover necessary day-to-day operational costs of the Exxon Valdez Oil Spill Restoration Office and administrative costs associated with overseeing current Trustee Council program objectives.

Science Panel Comments:

Not Applicable

Science Panel Recommendation: Not Reviewed

Science Coordinator Comments:

Not Applicable

Science Coordinator Recommendation: Not Reviewed

Public Advisory Committee Comments:

Not Available

Public Advisory Committee Recommendation: Not Available

Executive Director Comments:

Not Available

Executive Director Recommendation: Not Available

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 10100839-A
Project Title: Evaluating Injury to Harlequin Ducks
Principal Investigator: Tuula Hollmen
Affiliation: Not Available
Co-PIs/Personnel: Kathrine Springman
Disbursing Agency: ADFG
Project Location: Prince William Sound
Project Type: New

Funding Approved by Fiscal Year:

| | | |
|---------------------|---------------------|---------------------|
| FY11: \$0.00 | FY12: \$0.00 | FY13: \$0.00 |
| FY14: \$0.00 | FY15: \$0.00 | FY16: \$0.00 |

Total Funding Approved: \$0.00

Abstract:

In order to complete this project salary for Kathrine Springman, research faculty at Portland State University, is requested. She asks that this amendment be approved to cover her involvement in the testing, analysis and reporting of test results as her position at PSU relies upon grant funding. This work will include the testing originally scheduled for 2010, the analysis of results in conjunction with NCI, the synthesis of the analytical chemistry results (from SPMD extracts) with the biochemical results obtained in ASLC labs, and the data analysis and interpretation.

Science Panel Comments:

Not Applicable

Science Panel Recommendation: Not Reviewed

Science Coordinator Comments:

Not Available

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Available

Public Advisory Committee Recommendation: Fund

Executive Director Comments:

Not Available

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 11100853

Project Title: Pigeon Guillemot Restoration Research in Prince William Sound, Alaska

Principal Investigator: David Irons

Affiliation: USFWS

Co-PIs/Personnel: Dan Roby

Disbursing Agency: USFWS

Project Location: Prince William Sound

Project Type: New

Funding Approved by Fiscal Year:

| | | |
|---------------------|---------------------|---------------------|
| FY11: \$0.00 | FY12: \$0.00 | FY13: \$0.00 |
| FY14: \$0.00 | FY15: \$0.00 | FY16: \$0.00 |

Total Funding Approved: \$0.00

Abstract:

This amendment to project 070853, Pigeon Guillemot Restoration Research in Prince William Sound, Alaska, provides an opportunity to restore the population of Pigeon Guillemots (*Cephus columba*) in Prince William Sound, Alaska, which has declined by more than 90% at the Naked Island group since 1989. A restoration plan for Pigeon Guillemots in PWS was prepared to address the species' lack of population recovery following injury by the 1989 Exxon Valdez oil spill. Predation on nests and adults by mink is now the primary limiting factor for guillemot reproductive success and population recovery at the most important historical nesting site for guillemots in PWS (i.e., the Naked Island group). Mink on the Naked Island group are descended in part from fur farm stock and apparently were introduced to the island group during the 1980s. Eradication of mink at these islands was selected as the preferred restoration alternative because it is feasible and most likely to result in the recovery of guillemots in PWS. Other alternatives are either currently unavailable or unlikely to be effective. An eradication effort is likely to be successful due to both well-developed methods and the low likelihood of re-colonization. Potential negative effects of the preferred alternative are either negligible or largely avoidable. The guillemot population at the Naked Island group would likely double within the first 10 years following mink eradication, and the Sound-wide population of guillemots would likely increase within 15 years of mink eradication at the Naked Island group, once guillemots nesting at the Naked Island group had become a source population for other parts of PWS.

Science Panel Comments:

This proposal has been previously submitted to the EVOS Trustee Council and reviewed by the Science Panel. Support for the work was strong among the Science Panel members. One concern that arose pertained to the question of whether the mink found today on Naked and nearby Islands in the Naked group are descendants of the animals introduced artificially or whether these are fully native mink with an intact natural genome. That question has now been answered with DNA analysis revealing a mixed genome, not reflecting a pure native stock. This answer would appear to satisfy the question of whether these mink are natural (no) and to allow the extermination to move forward, if supportable scientifically by the Science Panel and Trustee staff and if politically and financially acceptable to the Trustee Council.

Here I will provide a review of the adequacy of the science. First, it is noteworthy that PIGUs are the only bird species still listed as Not Recovering after EVOS. Second, the importance of Naked Island and its potential recovery to this species is evident – the Naked Island group held about 25% of the PIGU population in PWS prior to the spill despite representing only 2 % of the PWS shoreline. Third, the inference that mink represent the impediment to PIGU recovery on Naked is strong, based especially on comparison Smith Island where mink are absent and PIGU survival is good. Fourth, the contention that strong recovery of PIGUs on Naked would lead to spread and re-colonization of other

suitable sites in PWS is a reasonable expectation, so restoration on Naked pays a wider dividend of recovery elsewhere in PWS. Fifth, we know that the introduced foxes are now gone from Naked so that isn't the problem. Sixth, the alternatives analysis is compelling in showing that no other restoration option would work and that eradication is the only solution. For example, providing more of the now reduced lipid-rich prey would be useless, resulting in feeding mink better not in enhancing PIGU survival and abundance. Culling would be a half-step and require costly intervention forever, and thus can be rejected as a viable restoration option. Seventh, elimination of predatory mammals on islands is a well-established practice to enhance ground-nesting seabirds and other birds.

Consequently, this proposal makes good sense scientifically and addresses an ongoing restoration failure of importance. The only questions involve the costs and the potential use of dogs, if trapping fails to get every last mink in the eradication process. The costs are 2.4 Million or 1.3 Million if a National Wildlife Foundation match is obtained. We concur that these cost estimates are reasonable because a 3-5 year time frame is needed to complete the removal. So while high, the expenditures are likely justified. The use of dogs in the removal of mink seems to possibly conflict with animal rights as an unacceptably cruel practice.

Science Panel Recommendation: Fund

Science Coordinator Comments:

This proposal is scientifically compelling and builds on four years of work focused on this topic. While the idea of a direct restoration project is appealing, I am concerned that the total project cost is very high in relation to the total number of nests that they project will be added to the island complex.

Science Coordinator Recommendation: No Consensus

Public Advisory Committee Comments:

Not Applicable

Public Advisory Committee Recommendation: Not Reviewed

Executive Director Comments:

I do not have a recommendation for this project. The project is very compelling because it potentially provides active restoration for an injured species. However, the high cost and speculation regarding the long-term outcome needs to be weighed carefully by the Council.

Executive Director Recommendation: No Consensus

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund

Project Number: 11100112

Project Title: Lingering Oil on Boulder-Armored Beaches in the Gulf of Alaska 22 Years after the Exxon Valdez Oil Spill

Principal Investigator: Gail Irvine

Affiliation: Not Available

Co-PIs/Personnel: Mark Carls, Dan Mann

Disbursing Agency: NOAA

Project Location: Prince William Sound

Project Type: New

Funding Approved by Fiscal Year:

| | | |
|---------------------|---------------------|---------------------|
| FY11: \$0.00 | FY12: \$0.00 | FY13: \$0.00 |
| FY14: \$0.00 | FY15: \$0.00 | FY16: \$0.00 |

Total Funding Approved: \$0.00

Abstract:

We want to continue long-term monitoring of lingering oil at six Gulf of Alaska sites where we have tracked the fate and persistence of stranded Exxon Valdez oil over the last 22 years. It has been six years since our last survey revealed that relatively unweathered oil still persisted at some sites. Interestingly these sites have less weathered oil (e.g., contains more n-alkanes) than similarly aged oil from Prince William Sound. All five of our monitoring sites on the Katmai National Park coast are boulder beaches with high wave energies. Accepted knowledge predicted that rapid natural weathering of stranded oil would occur in such settings. This was not the case, and we are still figuring out why. We think it is because the boulder armors that cover these shorelines protect the underlying oil. In addition to resampling our monitoring plots, we will be testing to see if oil is leaking out from these beaches. By extending our long term study of oil stranded on this little understood shoreline type, we will contribute important new data useful for predicting the geographic distribution of lingering oil, assessing its potential for continued pollution, and designing methods for its remediation.

Science Panel Comments:

This proposal represents a plan to return to oiled shorelines in the Kenai Fjords and Katmai National Parks and re-sample to determine the degree of oil persistence and its state of weathering so as to provide an updated record of the degree of persistence of oil and toxicity. Five of the historically sampled (on three previous dates) sites fall within Designated Wilderness. The project will also deploy passive samplers to assess whether oil is escaping into the sea waters and thus the ecosystem from the sub-surface reservoirs of lingering contamination. The last such survey occurred 6 years ago.

Costs of this project are relatively modest (178K in 2011 and 26K in 2012). This team has conducted identical surveys and related research in the past so the cost estimates presented in the detailed budget are likely accurate. The team produces partners from 3 different organizations, the National Park Service, the University of Alaska, and NOAA-Auke Bay lab. They each are experienced and well qualified for this work. This project examines beaches that differ from those already assessed in PWS in that these are high-energy beaches that would have been anticipated to promote oil weathering and degradation but surprisingly did not. The sequestering of oil in the sub-surface sediments of these beaches is thought to result from armoring by large boulders. In addition to repeating the surveys, this project proposes to assess the stability of the interlocking boulder assemblies as a mean of assessing whether that stability is involved in creating protection of buried oil from oxygen that could induce normal weathering. If true, this could suggest remediation procedures that could be subsequently tested.

On balance, this project has merit and would contribute useful observations on the extent of oil disappearance and chemical weathering over the past 6 years on troublesome sites. It would also advance to some degree our understanding of how oil sequestration persists in these energetic environments. The study lacks the detailed engineering, chemistry, and process-oriented science evident in the Boufadel proposal, yet this one does have merit and is far less expensive. The PIs have done a responsible job of writing up and publishing results of the previous surveys and participated in the EVOS process broadly. The fact that these problems persist in Designated Wilderness and shores of National Parks gives special urgency to progressing towards remediation. This proposal is of value but would not be rated as high in priority as the Boufadel proposal. There is some question as to whether the 30-d strip deployment used to detect any oil release from the sub-surface pools of lingering oil is to be done for and usually only a single 30-d period, in which case the weather and wave conditions could well make the outcome non-representative. Also would repeated-measures ANOVA provide more powerful tests and more insights? Furthermore, non-parametric tests like the Wilcoxon tests proposed are typically less capable of detecting differences than normal-based statistics and usually an arcsin transformation serves well to render variances equal and thus normality-based testing justifiable. But these are just quibbles in an otherwise well designed study plan.

Funding of this project is supported, which is reasonably priced with compelling budget justification, addresses an ongoing contamination issue, has potential to lead to mitigation (clean-up) measures, differs from the PWS beaches on which oil lingers in substantive ways, and affects a NPS which requires some special consideration.

Science Panel Recommendation: Fund

Science Coordinator Comments:

I concur with the science panel's review of this project.

Science Coordinator Recommendation: Fund

Public Advisory Committee Comments:

Not Applicable

Public Advisory Committee Recommendation: Not Reviewed

Executive Director Comments:

This project has merit and is of interest. However, this project examines the where and why of lingering oil, while the Boufadel project squarely addresses the more immediate Council concern of what should be done. Thus I would prioritize funding of the Boufadel project.

Executive Director Recommendation: Fund

Trustee Council Comments:

Not Available

Trustee Council Decision: Fund