



2017 Work Plan

Oil Spill Recovery Institute

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Prince William Sound Oil Spill Recovery Institute

2017 Work Plan

I. Purpose and organization of this document

This document describes the Oil Spill Recovery Institute (OSRI) 2017 Work Plan in the context of the overall Research Plan approved by the OSRI Board in October 2015 for fiscal years 2016 through 2020. The Research Plan should be referenced for detailed descriptions of the OSRI Program, the planning process and supporting documents. The annual reports and previous work plans should be referenced for more information regarding previously funded projects. The 2017 Work Plan provides descriptions of projects proposed for funding in the 2017 fiscal year beginning October 1, 2016 and a brief description of projects funded in previous years that have funding continuing into fiscal year 2017 (FY17). The OSRI Science Plan and previous OSRI Work Plans can be found on the internet at: www.pws-osri.org.

II. OSRI Strategic Goals and FY17 Work Plan New Projects

The Advisory Board of OSRI and the Executive Committee of the Board of Directors for the Prince William Sound Science Center (PWSSC) conducted a strategic planning session in 2014. The purpose of the planning session was to evaluate the past, the present, and plan for the future of OSRI. During that planning session the mission of OSRI was identified to be: **Support research, education, and demonstration projects that improve understanding and response to oil spills in the Arctic and sub-Arctic marine environments.** Four goals were identified as part of the strategic plan: Understand, Respond, Inform, and Partner (see OSRI Science Plan). The fiscal year 2017 Work Plan has been placed in the context of these four goals.

A. Goal #1 Understand:

Attain an interdisciplinary understanding of Arctic and sub-Arctic marine environments as it pertains to: baseline conditions; the sources, fate, and effects of spilled oil; and the recovery of those environments following a spill.

This goal addresses the OSRI mandate to “determine, document, assess, and understand the long-range effects of Arctic or subarctic oil spills”. The objectives listed in the science plan are to:

- Evaluate short and long-term effects.
- Identify chemical, biological, and physical impacts and consequences.
- Identify impacts of oil spill response options.
- Evaluate impacts from oil spills on the economy, lifestyle and well-being of people, and resiliency of communities and resource users.
- Achieve long-term coastal and ocean observing capabilities.

This work plan describes projects totaling \$274K for projects related to Goal #1. OSRI has elected to support a portfolio of initiatives, including:

- (1) Supporting the operation of SNOTEL meteorological stations in partnership with the Alaska Ocean Observing System (AOOS).
- (2) Oil degradation agent effectiveness.
- (3) Continuing partnership with NPRB for biological research.

a. SNOTEL stations (OSRI cost: \$10K)

One objective of the research plan is to achieve long-term coastal and ocean observing capabilities. AOOS and OSRI have had a long standing partnership in developing, testing, and maintaining the Prince William Sound Ocean Observing System. There are two primary goals of the Prince William Sound Observing System. The first is to combine long-term monitoring with short-term hypothesis-driven process studies to understand mechanisms underlying the regional ecosystem dynamics. Understanding the circulation and the patterns of water exchange will provide a solid scientific foundation for addressing fisheries and ecosystem management needs related to long-term oceanic and climatic variability. The second goal is to provide information to the major user groups in Prince William Sound (PWS) including the coastal communities, oil and gas transportation industry (tanker traffic and oil spill response), air taxis, commercial fishermen, recreational and commercial boaters, and Coast Guard search and rescue operations.

Understanding the circulation of Prince William Sound requires accurate measurements of wind fields and precipitation. Snowmelt runoff and rainfall creates a freshwater layer that sets up aspects of the surface circulation. By understanding the basic meteorological conditions, including precipitation, we hope to improve our ability to model the hydrology of Prince William Sound, improve our understanding of the forces driving seasonal changes in circulation, and provide oil spill response organizations with necessary data.

Snowpack Telemetry (SNOTEL) meteorological stations, set up in partnership with the Natural Resources Conservation Service (NRCS) and the Alaska Ocean Observing System (AOOS), measure precipitation from snow and rain throughout the year and are needed to establish the freshwater budget. Since the summer of 2005, six SNOTEL stations have been deployed at sea level in PWS, and two stations at alpine elevations. Each station in PWS measures temperature, wind speed and direction, precipitation, and solar radiation. With several years of data now available, we are able to test, more quantitatively, our understanding of freshwater input into PWS. The weather measurements are also important for oil spill trajectory modeling.

The annual operating cost for the weather stations is about \$3.5K per station per year. The operating costs include regular maintenance, calibration of sensors, access to the sites, and telemetry related expenses. Funding for operation of these sites has been transitioned to AOOS. The OSRI FY17 budget includes \$10K for upgrades and repairs to the eight existing systems.

b. Degradation additive effectiveness (OSRI cost: \$164K)

In FY16 OSRI released a request for proposals to address the effectiveness of degradation agents. Several products have been proposed as additives to spilled oil to speed up the natural degradation of oil by microbes. Few have been tested in conditions expected in the Arctic or sub-Arctic. Some have not been tested by independent parties. We desire to test the efficacy of these agents prior to a spill so we can understand their potential for spill remediation and their potential effects on the environment. There is a need to understand, if the agents are enhancing degradation or dispersing the oil, what the natural response time is to the additive, and what end and intermediate products are produced.

OSRI selected to fund a proposal from Dr. Leigh of the University of Alaska Fairbanks. The work aims to 1) evaluate the effectiveness of Oil Spill Eater II on crude oil and marine diesel degradation and detoxification in Arctic and sub-Arctic seawater, 2) determine its mode(s) of action, 3) compare its efficacy to that of chemical dispersants (Corexit 9500A), and 4) to assess effects on indigenous microbial communities. The proposal outlined a three-year research project to address these objectives.

This is the second year of a three-year research project and OSRI will provide \$164K of support in FY17.

c. Funding partnership with the North Pacific Research Board (NPRB) (OSRI cost: \$100K)

The NPRB and OSRI have science plans that encourage research partnerships and the two organizations have been partnering to fund research of joint interest since 2006. Section 4.2.3 of NPRB's science plan directly responds to a strong recommendation of the National Research Council to seek partnerships with other entities to support joint research and funding of projects of mutual interest. Similarly, Section III.A.1 of OSRI's research plan identifies a potential partnership with NPRB to support ecological research projects in Arctic and sub-Arctic climates. NPRB and OSRI have science and implementation plans that provide the foundation for defining research priorities of mutual interest in any given year.

This year OSRI will review proposals from many potential topic areas in the NPRB request for proposals that overlap with OSRI's research plan. The OSRI research plan notes that the nearshore environment is the most likely area to be impacted by an oil spill, therefore knowledge of the environment and ecology of this zone is of greatest use

to OSRI. There is also increasing pressure from shipping and oil development in the Arctic that makes that area of particular interest.

OSRI may contribute up to a total of \$100K for one or more projects relevant to its research plan.

B. Goal #2 Respond:

Enhance oil spill response and mitigation capabilities in Arctic and sub-Arctic marine environments.

This goal addresses the OSRI mandate to “identify and develop the best available techniques, equipment, and materials for dealing with oil spills in the Arctic and subarctic marine environment.” The objectives listed in the Research Plan are to:

- Identify and evaluate new prevention and response technologies.
- Evaluate relative benefits and consequences of specific response and mitigation techniques.
- Fill knowledge gaps on behavior of spilled oil.

The components to achieve these objectives are described below.

1. Technology research and development

This work plan describes projects totaling \$125K for projects related to Goal #2, oil spill response, OSRI is looking to fund projects in partnership with other organizations or that complement ongoing research programs.

a. Partnership proposals. (OSRI cost - \$125K)

A number of agencies, organizations, and industry members fund research designed to improve spill response. The missions of the various groups can be diverse, but overlap with OSRI’s mandate to identify and develop the best available techniques, equipment and materials for dealing with oil spills in the Arctic and sub-Arctic marine environment. Such organizations include, but are not limited to, the International Oil and Gas Producers Arctic Technology joint industry program (<http://www.arcticresponsetechnology.org/>), Bureau of Ocean Energy Management (BOEM, www.boem.gov), Bureau of Safety and Environmental Enforcement (BSEE, www.bsee.gov), Coastal Response Research Center (www.crrc.unh.edu), Alaska Clean Seas (ACS, www.alaskacleanseas.org), Prince William Sound Regional Citizens Advisory Council (PWSRCAC, www.pwsrcac.org), United State Coast Guard (USCG, <http://www.uscg.mil/hq/cg9/rdc/>), Emergency Preparedness Prevention and Response, North Slope Borough (www.north-slope.org), American Petroleum Institute (www.api.org), and the oil industry. The oil industry currently has several joint industry programs (JIP) focused on arctic spill response issues, including detection and tracking, improved mechanical recovery, in-situ burning, and fate of dispersed oil.

With the Arctic Technologies JIP active we expect that there will be opportunities to contribute to their efforts as gaps are identified from the existing laboratory and field work. Additional work with oil in ice may be available at the Cold Regions Research and Engineering Laboratory in partnership with Alaska Clean Seas. BSEE and USCG continue to fund research related to improving spill response in the Arctic and it may be possible to develop partnerships with them.

By pursuing potential partnerships OSRI can leverage its limited funds to engage in larger projects, expanding the total budget for innovation. It should be noted that it is inherently expensive to work in Arctic and sub-Arctic regions, which increases the cost of proposals. OSRI will look to contribute to a JIP aligned with our research goals. If a partnership in a JIP or elsewhere is unavailable for the OSRI developed research topics OSRI will develop and release an RFP as the sole funding source. The research topics will be guided by these OSRI science plan response subjects:

- 1) Oil Spill Detection and Tracking
- 2) Spill Response in Ice
- 3) Best Practices
- 4) Spill Response Information Tools

Potential areas of research include, but aren't limited to:

- 1) ShoreZone mapping of coastal regions for input into spill response information tools.
- 2) Improvements and demonstrating remote sensing technologies.
- 3) Detecting lingering oil
- 4) Developing and testing protocols for hazing or handling marine mammals.
- 5) Testing new spill recovery equipment in Arctic and sub-Arctic waters.
(Partnership with BSEE, ITOPF)
- 6) Determining the recovery characteristics of skimmers.
- 7) Improving communication capabilities during spills.
- 8) Demonstrating the capabilities of dogs to detect and delineate oil.
- 9) Developing best practices and tactic guides for spill response.

A total of \$125K is expected to be available to fund one or more proposals under this topic area.

Of particular interest this year are projects to determine the recovery characteristics of skimmers and detection of lingering oil using dogs.

Characterizing oleophilic skimmers partnership with Alaska Chadux Corporation.

To date, regulatory agencies such as the United States Coast Guard (USCG) and the Alaska Department of Environmental Conservation (ADEC) have not differentiated

oleophilic skimming devices and weir or suction devices with regards to contingency planning standards. Chadux hopes to demonstrate to the regulatory agencies that adoption of Best Available Technology (BAT) has a measurable advantage when it comes to cleaning up oil on water. In this project the recovery characteristics of two oleophilic skimmers will be tested using ASTM testing protocols. Testing will use both crude oil and marine diesel to determine changes in recovery characteristics associated with the collection of refined products. Additionally, the project will allow Chadux to train its employees with oleophilic skimmers under realistic conditions and learn to maximize their operational capabilities. Chadux also intends to open the training sessions to interested member company personnel, employees from other spill response organizations, and regulatory personnel.

OSRI will provide up to \$60K of support for this project to support the testing facility and bringing in a subject matter expert to ensure the testing is done to standards.

Detection of lingering oil using oil sniffing dogs

Dogs have long been used to detect various materials from drugs to explosives. Recently dogs have been trained to detect spilled oil and have been deployed on spills in the US and Canada. This project aims to determine if the dogs are capable of detecting lingering oil in Prince William Sound. Testing will occur on beaches with known patches of lingering oil to determine if the dogs can detect and delineate the size of the patch.

OSRI will provide up to \$65K of support for this project

C. Goal #3 Inform:

Share information and educate the public on the issues of oil spill prevention, response, and impacts.

The objectives of this goal are to:

- Publish scientific and technical results in open literature
- Brief the response community on OSRI products.
- Facilitate the exchange of information and ideas through workshops and other forums.
- Educate future researchers and responders through K-12 programs, undergraduate internships, and graduate fellowships.
- Convey information to the general public through various media.
- Be a source of expertise.

The approach to reach these objectives OSRI proposes spending \$165K to fund a suite of projects related to education and outreach along with supporting workshops and conferences that provide a means to disseminate OSRI research.

1. Education

Development of future researchers, engineers, and others involved in oil spill response requires an education component that exposes students to the issues important to ecology and technology. OSRI has been a strong supporter of education programs targeting students from kindergarten to graduate school. OSRI intends to continue building upon existing regional education and outreach programs.

a. Graduate Research Fellowships (OSRI Cost: \$90K for up to three students)

Support of graduate students provides a means of focusing people at the start of their careers on oil spill related issues. OSRI funds are provided to support graduate projects that will better understand the social and economic effects of oil spills on coastal communities, provide information needed by managers and decision-makers for oil spill response and recovery, improve the technologies available to spill responders, and improve public awareness and understanding of marine and estuarine ecosystems.

Masters students may be supported for two years and doctoral students for up to four years. Applications for extensions beyond that time frame will be considered during the last year of existing funding. Students will be expected to present results to the OSRI Board at some point in their fellowship. Up to three Graduate Research Fellowship projects will be supported in FY17. We anticipate two fellowships will support continuing students and OSRI will release an RFP for the selection of the third student. Up to \$30K of support per year will be available to each fellowship. A twenty five percent match by the proposing institution is required.

Continuing fellowship: Fate and Effects of Petroleum Contamination and Chemical Dispersants in Arctic Marine Environments Gofstein, University of Alaska Fairbanks. This study examines how Arctic marine ecosystems may be impacted by petroleum contamination by examining the fate of petroleum contaminants and chemical dispersants, their interactions with the environment, and the factors which influence their biodegradation. This project seeks to: 1) assess the influence of the dispersant Corexit 9500 on oil biodegradation processes in Arctic seawater; 2) investigate the fate of Corexit in marine environments; 3) study the effects of chemical dispersants on microbial community structure and function and identify the organisms responsible for degrading each in the Arctic; and 4) to investigate the extent of the role that nutrients play in driving the biodegradation of hydrocarbons, including identifying any nutrients that are possible limiting factors. Incubations of seawater from the Arctic Ocean in the presence of Alaska North Slope crude oil, Corexit 9500, and both together will be performed over a 60-day time course. Degradation of both components will be measured by GC/MS for the crude oil and by LC/MS/MS for the Corexit. Microbial analyses will be performed for each treatment using 16S rRNA sequencing using an Illumina MiSeq. Nutrients (NO_2^- , NO_3^- , NH_4^+ , PO_4^{3-} and SiO_4^{4-}) will be measured flow injection analysis and total iron by atomic absorption spectroscopy. Results from this study will help enable decision makers to make an informed choice of appropriate response strategies in the event of a spill as well as increase our general understanding of petroleum biodegradation in the Arctic marine environment.

OSRI will provide \$30K of support for this Ph.D. project. This is the second year of a three-year proposal.

Continuing fellowship: Crude Oil Movement in Sea Ice: Development and Validation of a Parametric Model of Oil Migration Oggier, University of Alaska Fairbanks.

Economic interests of the oil and gas industry as well as the maritime shipping sector have increased in the Arctic over the past few decades. Despite a decline in the summer sea ice extent, Arctic waters will remain infested with sea ice for a significant part of the year in the foreseeable future. Hence, the hydrocarbon industry will need to cope with sea ice during routine operations. Understanding and predicting the fate of oil in sea ice is crucial to assess risks to ecosystems and people and to effectively respond to an oil spill in Alaskan Arctic waters.

The objective of the proposed research is three-fold:

- Development of a simple oil migration model that draws on previous work; the model is run in parallel with an oil spill laboratory experiment for parameterization and validation of predictions of onset and extent of oil percolation (depth penetration, volume of oil pervading ice matrix, expected surfacing time).
- Validation of the model based on observed oil percolation with the aid of X-ray tomography and sea-ice thin/thick optical sections.
- Evaluation of the utility of a portable X-ray tomographer to characterize the oil distribution and support prediction for operational purposes in an experiment setting representative of conditions in the field.

The following methods will be applied:

- (1) Development of the oil migration model. The model will run with simple input such as ice conditions (thickness, temperature and porosity), weather variables (temperature, HR ...) and oil parameters (volume, physical properties).
- (2a) Controlled oil spill simulation in a laboratory experiment under conditions representative of the field with continuous in-situ temperature, relative humidity measurements
- (2b) Simulation of oil percolation with daily update based on measured experimental variables
- (3) Comparison between simulation and experiment, based on (1) daily observations (ice surface, temperature) and (2) X-ray tomography data and thin-thick section.

The proposed research is significant in advancing knowledge through better prediction of oil percolation in case of an oil spill. Such understanding and the availability of a model suitable for operation prediction will help recovery efforts, e.g., in determining

the most suitable time frame for the clean-up response and the choice of the method applied, and in supporting NRDA exposure evaluation.

OSRI will provide \$30K of support for this Ph.D. project. This is the second year of a two-year proposal.

b. K-12 Programs: (OSRI Cost: \$60K)

OSRI will continue to support the Prince William Sound Science Center's Headwaters to Ocean program in order to introduce younger students to the concepts important to understanding oil spill response and the recovery of the environment. Programs include components such as oceanographic monitoring, environmental education, and an introduction to oceanographic technologies. Beyond classroom delivery in PWS, OSRI is requesting that portions of the Discovery Room program be delivered to at least two other geographic areas in the north, west, or Aleutian Island regions of the state, or at a gathering that brings together people from those areas. OSRI desires a proposal that continues to support the existing education efforts and includes travel for delivery of materials to other communities.

This funding is for a single year to continue the Headwaters to Ocean environmental and technical education at the K-12 level. OSRI will provide \$60K in FY17. The total cost of this program is between \$130K and \$150K and is supported by a wide array of other funding sources including grants and contributions.

2. Outreach

Outreach to the public, researchers, and spill responders is important in ensuring OSRI's activities provide benefits and are peer-reviewed. Several means have been used to publicize OSRI's activities including sponsoring workshops and conferences, outreach activities of the Research Program Manager, and supporting public outreach through lecture series, radio programs, and development of printed materials. This year the funding for the latter activities has been included in the Research Program Manager's budget.

a. Workshops and Conferences (OSRI cost: \$15K)

These funds are for workshops or special projects at the discretion of the OSRI Advisory Board. Funding is set aside for regularly scheduled conferences where OSRI funded research is presented and for supporting workshops that help OSRI achieve its mission. Workshops being considered for FY17 support include:

(1) **Alaska Marine Science Symposium.** (OSRI cost: \$5K) Each January, researchers from throughout Alaska are invited to participate in a 3-4 day conference. It is an excellent opportunity for presentation of new results and networking. OSRI will contribute \$5K to support this workshop, which will be held in late January in Anchorage.

(2) **Alaska Forum on the Environment.** (OSRI cost: \$5K) OSRI will continue its support of the Alaska Forum on the Environment, which is typically during February in Anchorage. The conference covers many issues relevant to understanding the potential impact of oil spills in Arctic and sub-Arctic marine environments. OSRI will allocate \$5K to the Alaska Forum on the Environment. A limited number of registration waivers will be available for the staff, Board, and Scientific and Technical Committee to attend the workshop.

(3) **Workshops of opportunity.** (OSRI cost: \$5K) Many important workshops occur that could provide improved products with a little additional support. The support provided here is intended to help cover the cost of running the workshop, the addition of teleconference capabilities, providing a facilitator or report editor, or other needs. We foresee several opportunities to support such workshops this fiscal year. This year we expect that support may be provided to the Northern Oil and Gas Forum, travel to the International Oil Spill Conference, or support of the Alaska Oil Spill Technology Symposium. OSRI will allocate a total of \$5K to support workshops that align with the OSRI mission.

D. Other Programs

1. Program coordination (OSRI cost: \$150K). The position of OSRI Research Program Manager is a programmatic expense. The total costs include salary, benefits, travel and commodities. The Research Program Manager's responsibilities include:

- Preparation of the annual work plan in consultation with the Board-appointed Work Plan Committee and in accordance with the Five-Year Science Plan adopted in 2005. Compiling information about potential projects, writing brief project descriptions and preparing project budget estimates.
- Implementing the work plan as approved by the Board. This includes drafting requests for proposals based on the Annual Work Plan priorities, and coordinating the peer review process with OSRI's Scientific and Technical Committee and with other organizations OSRI partners with for research projects.
- Coordinating with the Chair of OSRI's Scientific and Technical Committee (STC) to assure regular transfer of information between the OSRI Board and the STC. Also provide assistance, as requested by the STC Chair, in scheduling meetings.
- Meeting 2-3 times per month with the OSRI Executive Director (ED) to exchange information concerning program issues and contract awards. Work with the ED to develop a monthly program report for distribution to the OSRI Board.
- Assisting the Executive Director to ensure compliance with all policies and procedures of the OSRI Grant Policy Manual.
- Coordinating the processing of contracts for successful proposals. Monitor progress and final report deadlines for these contracts.

- Preparing bi-annual reports on OSRI grant awards and research and education programs for distribution to the OSRI Board.
- Preparing and publishing an annual report for broad distribution.
- Supervising maintenance of the OSRI website.
- Collaborating with the OSRI Executive Director to develop and maintain cooperative agreements with other organizations for research and education programs, for example with the Exxon Valdez Oil Spill Trustee Council, two Regional Citizens' Advisory Councils, the Alaska Department of Environmental Conservation, the Alaska Ocean Observing System (AOOS), the North Pacific Research Board, the UNH/NOAA Coastal Response Research Center, Bureau of Safety and Environmental Enforcement, Bureau of Ocean and Energy Management, and Joint Industry Programs.
- Periodically representing OSRI at professional meetings and workshops.
- Maintaining files and a library on oil pollution issues.
- Providing leadership in planning future research programs and work plans.
- Preparing technical reports on OSRI programs.
- Overseeing many outreach activities including presenting at workshops and conferences, maintaining the OSRI website, and publishing the OSRI annual report. Other outreach efforts are aimed to disseminate OSRI efforts through a wide array of media options, such as printed materials, radio broadcasts, and video or computer presentations.

OSRI funding will provide approximately \$130.5K personnel (10.0 months), \$8.8K travel, \$10.2K contractual, and \$0.5 K commodities for a total of \$150K.

2. OSRI Science and Technical Committee meetings (OSRI Cost: \$6K).

Funds are set aside to support the functions of the OSRI Science and Technical Committee, and to support Board and STC travel related expenses associated with OSRI partnerships such as the JIP, NPRB, etc.

E. Partnerships

The use of partnerships is a goal outlined in the OSRI strategic plan. While there is not any funding that is dedicated solely to the development or maintenance of partnership programs, there are many existing partnerships and opportunities to develop new partnerships. We continue to partner with the Alaska Ocean Observing System (AOOS) to support an ocean observing system in Prince William Sound and to validate the physical and biological models developed through efforts by OSRI and AOOS. We are examining new partnerships with AOOS as they transition into their next five-year research plan. We continue to partner with NPRB to gain knowledge on the ecology of Alaskan waters and examine issues regarding oil toxicity. We are looking to partner with organizations like the Defenders of Wildlife and the North Slope Borough Wildlife Department that also have research related to understanding the impacts of oil spills.

To achieve our objectives under the Respond goal requires partnerships. We are looking to work with industry-sponsored research programs that align with OSRI's science plan. The Arctic Technology JIP includes six different programmatic areas, four of which are closely linked with the goals outlined in the OSRI science plan. Many of their projects will be completed in this year and gaps in their efforts identified for future funding opportunities. BSEE and USCG also have important programs to follow. BSEE recently had a call for white papers that included several topics related to improving spill response in the ice environment. The USCG continues work to test technologies in the ice environment. Their work provides a relatively low cost to test some emerging technologies.

Our Inform goal related projects are also heavily dependent on partnerships, most often developed by the programs we fund. OSRI contributes a portion of the cost of the education programs outlined. These programs gain additional funding from several private, corporate, and grant contributions. The Discovery Room is also a collaborative effort with the U.S. Forest Service and the Copper River Watershed Project. OSRI contributes small amounts to the Alaska Marine Science Symposium and the Alaska Forum on the Environment. The workshop of opportunity section is designed to provide an opportunity to develop new partnerships to achieve OSRI's goals.

F. FY17 New Programs Spending Summary

Area	Project	FY17 Work Plan
Understand		
	Meteorological Stations	\$10K
	Biodegradation Agent Effectiveness	\$164K
	NPRB Partnership	\$100K
		\$274K
Respond		
	Skimmer Characterization	\$60K
	Detection Using Dogs	\$65K
	Partnership Projects	\$0
		\$125K
Inform		
	Graduate Fellowships	\$90K
	K-12	\$60K
	Workshops	\$15K
		\$165K
Other		
	Research Program Manager	\$150K
	STC Travel	\$6K
		\$156K
Subtotal		\$720K
Administration		
	Based on 20% of total expenditure	\$180K
Total		\$900K

III. Prior Years' Encumbered Projects Continuing in FY17

Because OSRI projects are started at the beginning of each quarter, many projects funded in previous years will continue into fiscal year 2017. The purpose of this section is to identify those projects so that the work plan aligns with the FY17 budget sheets. These projects are listed as the Prior Years' Encumbered portion of the budget. If an existing project is to get new funding in FY17 – multi-year grants – the project description exists in the previously provided section. Because the exact amount of funds that are being carried forward will not be known until sometime in October, there are no dollar amounts provided with the individual projects.

A. Goal #1 - Understand

a. Bering Strait Marine Mammal Mapping Portal Tool.

This project aims to create a framework and interface for a Bering Strait Response Tool (BSRT). Of key interest to OSRI is the gathering of information on marine mammal distributions within the Bering Strait region. The GIS layers will be made available for inclusion into other spill response tools, such as Arctic Environmental Response Management Application (ERMA) and through the AOOS portal. The BSRT will serve as a visual aid for Defenders' Arctic Marine Mammal Spill Response Synthesis which consists of spill response plans, gap analyses, reports and recommendations that contain an Arctic marine mammal focus from the State of Alaska and various federal land and wildlife agencies operating in Alaska.

b. Assessment of immediate and delayed sublethal responses of juvenile silver salmon to exposure to North Slope crude oil and Corexit 9500

(Wetzel, Mote Marine Lab, contracted through 06/30/2017)

Controlled exposure studies allow scientists to assess cause and effect relationships between stressors and responses of organisms. Lack of understanding of such relationships can limit the effectiveness of management and conservation decisions. Using CROSERF (Chemical Response to Oil Spills: Ecological Research Forum) protocols (adopted for the Deepwater Horizon NRDA), we will expose juvenile chum salmon (*Oncorhynchus keta*) to several Alaskan crude oils and Corexit 9500 dispersant concentrations under acute spiked exposure regimes. To assess significant sublethal responses of exposed fishes, we will conduct biomarker assays designed to measure genotoxicity, lipid composition, and cytokine levels (immune function), and then develop DNA expression and cytokine protein microarrays to assess changes in expression of genes regulating immunity. We will assess morphometrics, standard blood chemistry, and contaminant levels in tissues for exposed and unexposed fishes.

Assessments will occur immediately after exposure and be repeated to assess delayed impacts. Results of these studies will document how exposures to oil and/or dispersant in the field could affect sustainability of salmon, and by extension other Alaskan fish stocks of commercial, subsistence, and ecological importance. Finally, the project facilitates creation of a regional center of excellence for controlled exposure studies using a range of life stages for other Arctic marine fishes and invertebrates of concern in Alaska and the Pacific Northwest. The proposed study is inclusive of all four strategic goals of the Oil Spill Recovery Institute (OSRI), namely to:

1. Understand: evaluate both short- and long-term effects of oil and dispersant exposure to nearshore species for determining their possible impacts on economics and the environment for future emergency response planning;
2. Respond: through careful assessment of effects of oil and dispersant exposures on key Alaskan species, information regarding a range of responses will be rigorously evaluated for judging the most prudent mitigation scenarios;
3. Inform: a combination of scientific presentations, publications, local community meetings and educational outreach will alert stakeholders and other interested parties to current scientific techniques and interpretations of exposure responses leading to important social, economic and environmental outcomes; and
4. Partner: some of the most notable accomplishments of this proposed work will be to help build local capacity for enhanced toxicity research in Alaska, form strong partnerships with the oil industry and create productive common interest research program collaborations with partners in the Arctic and Sub-Arctic regions of Alaska for a state wide integrated oil spill response coordination.

B. Goal #2 Respond:

a. Update of Field Guide For Oil Spill Response in Arctic Waters.

The Emergency Prevention, Preparedness and Response (EPPR) program of the Arctic Council developed the *“Field Guide for Oil Spill Response in Arctic Water”* that was published in 1998 (*“1998 EPPR Field Guide”*). The primary objective of the proposed project is to update and improve that document based on recent (1998-2015) research programs and other studies related to oil spill response in the Arctic.

The proposed revision of the 1998 EPPR Field Guide would address all four OSRI mission goals and topics in terms of: understanding response options; responding through identifying relevant new respond technologies; informing the public and responders on issues related to oil spill response; and by partnering with the EPPR program of the Arctic Council.

The proposed revision of the EPPR Field Guide would be accomplished by:

- Initial development of an extended Table of Contents (TOC) for review and comment by the EPPR working group to ensure that the scope, format and content are agreed and that the project is on track before writing is initiated.
- Incorporation of new knowledge and information into a revised text.
- Propose addition of an introductory “user manual” and of new sections on “Health and Human Safety in the Arctic”, “Wildlife Response in the Arctic”, and “Logistics and Response Strategies in the Arctic”.
- Consideration of a restructuring and reorganization of the current Sections 4 and 5 to update and revise these in order to potentially remove or reduce duplication.

The project would be a significant advancement as the revised EPPR Field Guide would:

- update knowledge and information to a widely accepted useful tactics-focused document^a, and
- complement the recent strategy-focused 2015 EPPR “*Guide to Oil Spill Response in Snow and Ice Conditions in the Arctic*”^b.

b. Shorezone Mapping of the Eastern Aleutian Islands

The ShoreZone Coastal Habitat Mapping System has been implemented by Coastal and Ocean Resources (CORI) for most of Alaska (Fig. 1) and has become an important resource management tool for habitat management, spatial marine planning, as well as oil spill response groups in government and industry. The latter is especially relevant for the Oil Spill Recovery Institute. ShoreZone imagery and maps now extend through British Columbia, Washington, and Oregon representing one of the largest spatially contiguous coastal habitat datasets in North America. The ShoreZone program in Alaska has been funded by many resource agencies and institutions, and CORI and NOAA jointly manage the data¹. The imagery and map data are freely available to the public from a web site hosted by The Nature Conservancy (<http://www.shorezone.org>).

ShoreZone is a benthic coastal habitat mapping system that was developed in the late 1970s and substantially revised in the early 1990s with the addition of biological attributes. From 1993 to the present the ShoreZone mapping system has been applied to shorelines in Washington, British Columbia, Oregon, and Alaska and the imaging and mapping protocols are documented in various protocol manuals. The last revision was written in 2013 to address changes implemented in 2010-2012, primarily the addition of a Coastal Vulnerability Module. We are currently implementing another revision that is fully backward compatible and includes:

- a. Classifying the Environmental Sensitivity Index according to NOAA protocols,
- b. Quantitative methods to classify and map biobands and substrate (see detail in section below),

- c. Incorporating the best available NOAA CUSP digital shoreline,
- d. Imaging and mapping sensitive areas such as sea lion and walrus haulouts,
- e. Integrating Structure from Motion elevation models into the ShoreZone workflow.

The objectives specifically identified as part of this project include:

ShoreZone mapping for the Eastern Aleutian Islands: CORI will map habitat attributes using both georeferenced high definition video and high-resolution still photos for the Fox Islands which include: the Krenitzin Islands (Akutan Island, Rootok Island, Svatanak Island, Akun Island, Taginak Island, Tigalda Island, Aiktak Island, and Ugomak Island); Unalaska Island; and Umnak Island.

C. Goal #3 Inform:

a. Graduate Research Fellowships

Continuing fellowship: Combining Long-term Data and Ecological Modeling to Assess Sensitivity of Coastal River Otters to Climate Change

Barocas, University of Wyoming.

Catastrophic oil spills such as the Deepwater Horizon, *Exxon Valdez*, or the *Esso Bernicia* are rare, but their ecological impacts can last for decades. The acute and lingering chronic effects of such oil spills have been well studied, demonstrating that long-term monitoring of ecosystems affected by such ecological catastrophes is necessary for future management recommendations.

In the over-two-decades since the *Exxon Valdez* Oil Spill (*EVOS*), Alaska coastal ecosystems have shown strong signs of recovery. One of the first species to recover from *EVOS* was the North American river otter (*Lontra canadensis*). The long-term, multi-agency, studies of river otters following *EVOS* highlighted their susceptibility to environmental catastrophes, their sensitivity to climate-induced changes in fish communities, and their key role in linking aquatic and terrestrial ecosystems at the land-margin. These attributes led to the identification of river otters as a sentinel species.

A recently developed spatially explicit individual-based model predicts a shift in social behavior and population declines of river otters in response to reductions in forage fish abundance. Thus, long-term monitoring of river otter sociality, diet composition, and abundance in various locations along the Alaska coast provides insight into ecosystem recovery from *EVOS* and its responses to the threat of climate change.

The scientific advances in understanding river otter ecology were complemented by intensive demographic and genetic surveys, conducted in various sites of coastal Alaska. The magnitude and diversity of the research efforts over the past two decades yielded a wealth of data that is currently deposited in various formats maintained by various

agencies. In order to establish valid monitoring program for river otters, a systematic inventory of the diverse types of data, and a subsequent synthetic analysis will be required.

This project aims to compile the data collected from the various river otter studies, methodically sort them, and store them in a permanent database managed by the Alaska Department of Fish and Game. Using the compiled data, several hypotheses concerning spatio-temporal changes in sociality and abundance of river otters in relation to the historical effects of *EVOS* and projected climate change will be examined. Models will be developed based on historic and recently collected data with new analytical methods (e.g., dynamic linear modeling and network theory) and then validated by investigating current river otter sociality and abundance. These models will then be applied Regional Climate Models to project river otter abundance, sociality, diet, and nutrient transfers from sea to land.