FY16 PROGRAM PROPOSAL SUMMARY PAGE

Program Title: Long-term Monitoring of Marine Conditions and Injured Resources and Services

Program Period: February 1, 2016 – January 31, 2017

Team Lead(s): Molly McCammon (Alaska Ocean Observing System, 1007 W. Third Ave, suite 100, Anchorage, AK 99501, mccammon@aoos.org, 907-644-6703), Katrina Hoffman (Prince William Sound Science Center), Kris Holderied (NOAA Kasitsna Bay Laboratory)

Program Website: www.gulfwatchalaska.org

Abstract*: The goal of the Long-term Monitoring (LTM) program, known as Gulf Watch Alaska, is to provide sound scientific data and products that inform management agencies and the public of changes in the environment and the impacts of these changes on *Exxon Valdez* oil spill (EVOS) injured resources and services. The five-year program includes: 1) four monitoring components (environmental drivers, benthic, pelagic, lingering oil); 2) data management services; 3) integrated syntheses of data; 4) historic data recovery and syntheses; and 5) science outreach.

The program has six primary objectives:

1. Sustain and build upon existing time series in the EVOS-affected regions of the Gulf of Alaska.
2. Provide scientific data, data products and outreach to management agencies and a wide variety of users.
3. Develop improved monitoring for certain species and ecosystems.
4. Develop science synthesis products to assist management actions, inform the public and guide monitoring priorities for the next 20 years.
5. Enhance connections between the Gulf Watch Alaska and Herring Research and Monitoring (HRM) programs.
6. Leverage partnerships with outside agencies and groups to integrate data from broader efforts.

Some highlights from our progress in year 4 of the program include:

- Completed all project sampling and program annual reports through year 3
- Updated and added information to the program website (www.gulfwatchalaska.org) and data portal
- Completed and submitted program synthesis report and response to comments
- Held successful annual meeting and synthesis workshop, presented and participated in the joint programs science meeting in February
- Collaborated with the HRM program in joint synthesis reports, program meetings, and program reports

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA*):

FY12	FY13	FY14	FY15	FY16	TOTAL
2,904.7	2,675.3	2,993.9	2,925.0**	2,530.4**	$14.028.9**

**Includes a FY shift of funds from FY14 to FY15 for lingering oil 14140114-S*

***Includes AOOS/Axiom Data Management Extension project FY2015-2016*

Note: Figures given in $1,000 increments

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$1,784.0	$1,738.0	$1,823.0	$1,802.0	$1,536.0	$8,614.0

Date: September 1, 2015

I. Executive Summary

This proposal is a continued program funding request for year-5 of the five-year funding cycle for the Long-term monitoring (LTM) program known as Gulf Watch Alaska. The Gulf Watch Alaska program is structured in four components: Environmental Drivers, Pelagic monitoring, Nearshore monitoring, and Lingering oil. The broader framework of the program also provides for administration, data storage and management services, synthesis and coordination, and public outreach. The overarching goals of the program are to collect and analyze long-term ecological monitoring information from the Gulf of Alaska Exxon Valdez Oil Spill (EVOS) affected region, to make it publicly available, and to assess it holistically in order to better understand the range of factors affecting individual species and the ecosystem.

The program is structured into the following components. We have included project highlights from this past year for each of these continuing projects. Detailed Fiscal Year 2016 proposals for each of the individual projects are provided in the program's Ocean Workspace to EVOSTC staff members.

Integrated program management, data services, outreach, science synthesis and modeling

- *Program coordination and logistics – Katrina Hoffman and Molly McCammon, Prince William Sound Science Center (PWSSC) and Alaska Ocean Observing System (AOOS)*

In February, we submitted the annual report to EVOSTC and NOAA. All PI meetings were conducted as scheduled (quarterly meetings by teleconference). The Science Review Panel participated in the 2015 joint science meeting between GWA and HRM. PWSSC had a clean audit completed. Program coordinators have met all meeting logistics needs and all contracts and invoice management efforts are going smoothly. PMT members and PIs submitted coordinated comments on the FY17-21 draft RFP to EVOSTC staff.

- *Outreach – Molly McCammon, AOOS*

Project investigators continue to provide outreach to a wide variety of audiences both in and out of Alaska. These include lectures, public presentations, peer-reviewed publications, and radio podcasts. In addition, another summer season of Discovery labs, hosted by the Kachemak Bay National Estuarine Research Reserve, provides additional public access to Gulf Watch Alaska researchers and data. The website continues to be a primary outreach tool. In the past year we initiated two new outreach products: an online virtual field trip about the GWA program and a portable exhibit about the program, both produced by the Alaska SeaLife Center. Final products will be available in September 2015. Products from the two community based filmmaking workshops in Nanwalek and Tatitlek were finalized and plans for more broadly circulating the video products are being developed.

- *Data management –Molly McCammon and Rob Bochenek, AOOS/Axiom Consulting*

Project investigators continue to provide core data management oversight and services for the LTM project Gulf Watch Alaska. During this reporting period, investigators met with National Center for Ecological Analysis and Synthesis investigator Matt Jones to coordinate future activities. PIs have participated in regular PI meetings, including the in-person meeting in November 2014 and the January 2015 data meeting and are coordinating activities between the Herring and LTM programs. In addition, the AOOS Ocean Research Workspace, rolled out to PIs in Year 1, continues to be used as the internal staging area for program data.

EVOS LTM data management extension project- Rob Bochenek, Axiom Consulting: This additional project supplements EVOS LTM program data management. Based on needs identified by EVOSTC Science Panel and staff, we proposed and were awarded funding for this extension project. The project increases the data management support for both LTM and PWS Herring programs by establishing a data

coordinator position to improve metadata quality and best practices. Furthermore, this project allows for development of mechanisms to transfer and integrate LTM and PWS Herring program data products into DataONE. Funding was awarded for this project beginning March 1, 2015. We have recruited and hired the data coordinator position, Ms. Stacey Buckelew, who began work on the project on June 1.

- *Historical data management and synthesis – Matt Jones, National Center for Ecological Analysis and Synthesis (NCEAS)*

Over the past six months, both of the synthesis working groups met in Santa Barbara and are developing papers based on their respective proposals. Groups plan to meet three additional times over the next 18 months of the program. In addition, we met with the Gulf Watch Alaska program management team and Axiom staff to coordinate data collection to complete the historic data portfolio and develop a coordinated task list for improving user access and ease of use for the LTM program data sets and information.

- *Science coordination and synthesis – Kris Holderied and Tammy Neher, NOAA Kasitsna Bay Laboratory (KBL)*

This year, we held a successful annual meeting focused on preparation of the program synthesis report submitted on December 1 and planning for the EVOSTC joint science workshop in February. We also held an in-person meeting at the Alaska Marine Science Symposium and two quarterly teleconferences with participants from each project. The science coordinator worked with program scientists to update metadata forms for the public portal as well as working with the outreach committee to update the program website and You-Tube channel. The science coordinator collected responses to comments from the team and also provided minor revisions for the synthesis report completed in August. Finally, scientists within the two programs (including Herring Research and Monitoring) have chosen to work to develop a special issue with one of five possible journals as a means to not only address our reporting requirements of the programs, but also to meet our goals of making the program science accessible to the public and managers. The science coordinator researched five journals for joint special issue publication from the group, solicited assistance from the group in a planning committee, and we plan to begin development this fall, including a joint programs workshop in November.

- *Conceptual ecological modeling– Tuula Hollmen, Alaska Sea Life Center (ASLC)*

Over the past six months, we have developed the framework and compiled data for a nearshore system model, which will be used to examine the impact of changes in invertebrate prey fields on consumers of interest as measured by a suite of behavioral and demographic performance metrics. In addition, our manuscript describing conceptual modeling methods was accepted for publication, cited as:

Sethi S. and T. Hollmen. Conceptual models for marine and freshwater systems in Alaska: flexible tools for research planning, prioritization, and communication. Arctic, in press.

Environmental drivers monitoring component

- *Gulf of Alaska mooring (GAK1) monitoring – Tom Weingartner, University of Alaska Fairbanks (UAF)*

The most recent results stem from the 2015 GAK 1 CTD samples and the mooring (recovered in March 2015). We present these in two ways. Figure 1, shows the anomaly time series computed over the entire GAK 1 mooring record (2000 – present). Our focus here is on the evolution of the warming anomaly that began in mid-2014. This anomaly appeared rather abruptly at GAK 1 in June 2014, was confined to the upper 100m, and attained a maximum value of ~+3°C above normal. The anomaly gradually penetrated with depth over the remained of the year. By the beginning of 2015, a positive thermal anomaly encompassed the entire water column, with maximal values of ~+2°C between 50 and 75 m depth. The evolution of the anomalous salinity profile over this same time period was less clear, although in general the upper water column included a negative (freshening) salinity anomaly. The same transitions are also evident in the longer (1970 – present) CTD record, although the anomaly magnitudes differ from the

mooring record due to differences in record-length and sampling design. On the basis of this record, late fall 2014 through winter 2015 appears to be one of the warmest winters recorded at GAK 1 and is comparable to the anomalies observed in 2003.

The following results have emerged within the past year and are based on the 45 years of GAK 1 sampling:

1. 0.20 °C decade-1 temperature increase at surface and over upper 100 m
2. 0.15 °C decade-1 temperature increase between 100 - 200 m
3. 0.15 decade-1 salinity decrease at surface
4. 0.08 decade-1 salinity decrease over upper 30 m
5. NO SALINITY CHANGE: 30 – 100 m
5. 0.025 decade-1 salinity increase over 100 - 200 m

These changes are a consequence of:

6. Discharge shows 40+ year increasing trend.
7. Warmer and wetter winters and increased glacial ablation.
8. A decrease in wind mixing.

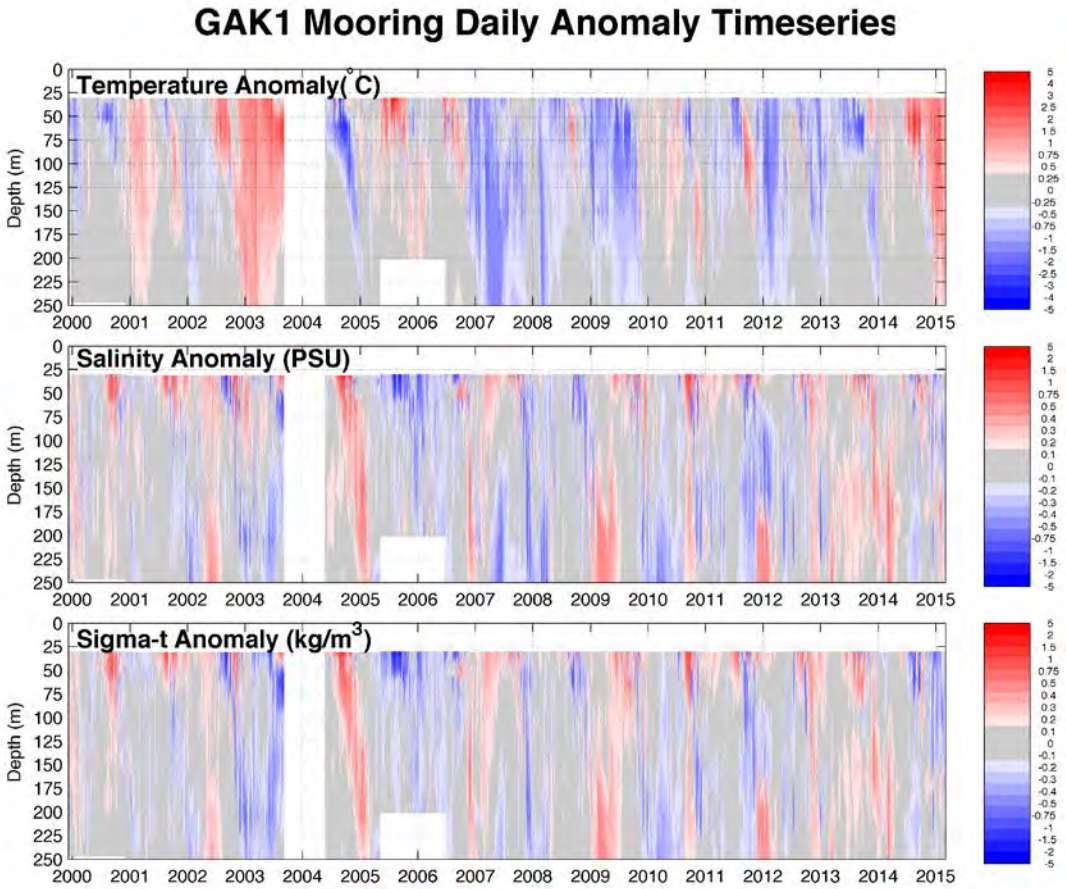


Figure 1. From top to bottom: temperature, salinity, and density (sigma-t) daily anomalies computed from the GAK 1 mooring over the 2000 – 2015 period.

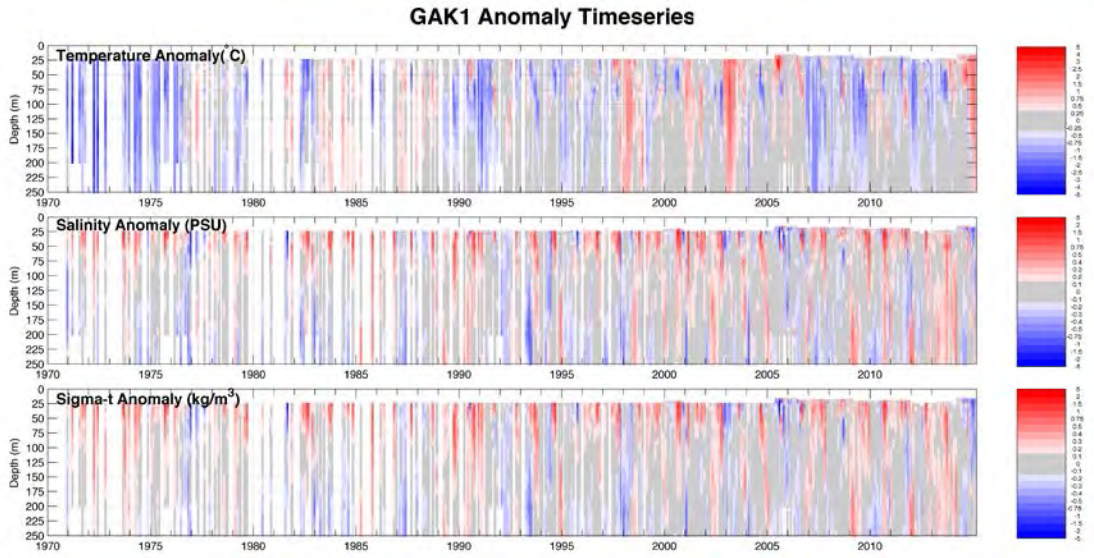


Figure 2. From top to bottom: temperature, salinity, and density (sigma-t) monthly anomalies computed from the GAK 1 CTD record for the 1970 – 2015 period.

- *Seward line monitoring – Russ Hopcroft, UAF*

During surveys conducted during this reporting period, we found that the anomalously warm water temperatures from fall 2014 have persisted throughout the winter along the Seward line. The average upper-100 m temperatures for the GAK stations were 0.9-1.3 °C above the 18-year mean for those stations, with the largest anomalies at the offshore end. Averaging 1°C along the line, this anomaly is very close to those observed during the 1998 and 2003 El Niño events. We also extended the line offshore to encompass stations GAK14 and GAK15. All offshore stations were sampled to 1000 m depth with the CTD.

- *Oceanographic conditions in Prince William Sound – Rob Campbell, PWSSC*

During this reporting period, we have noted that central PWS has been exhibiting the same warm water temperature anomaly that has been observed recently throughout the North Pacific, superimposed over a general warming trend. Analysis of a now ~40 year time series shows a surface cooling trend in the northwestern portion of PWS, presumably driven by the very large losses of ice mass and meltwater runoff into the surface water. Observations from the profiler and satellites suggest that the 2015 spring bloom in PWS was 3-4 weeks later than usual and of a much smaller magnitude than prior years.

- *Oceanographic monitoring in Cook Inlet – Angie Doroff and Kris Holderied, Alaska Department of Fish and Game (ADFG) / Kachemak Bay Research Reserve (KBRR)/ KBL*

Some highlights from our project this past year include:

  - The Kachemak Bay Research Reserve and NOAA Kasitsna Bay Laboratory are using oceanographic data from this Gulf Watch Alaska project to help validate a Cook Inlet ocean circulation model developed by NOAA's National Ocean Service, which has been used for a tidal energy assessment of the Inlet and will be part of a NOAA operational Cook Inlet marine forecast system (currently planned to be operational in 2017). KBRR and the University of Alaska Fairbanks (UAF) are using time series of oceanographic data (temperature and salinity) from long-term monitoring studies (inclusive of but not limited to this project) and drifter buoy data in an external model validation effort. KBL is providing CTD data to the model developer (NOS Coast Survey Development Laboratory) for development and validation efforts. Model outputs from the validation work in Kachemak Bay will help inform harmful algal bloom monitoring and tracking of marine pollutants.

- KBRR and KBL leveraged EVOSTC-funded oceanographic surveys to improve the time series and geographic scope of ongoing monitoring for harmful algal species.
- The phytoplankton species that causes paralytic shellfish poisoning, *Alexandrium fundyense,* has not been found in significant concentrations this past year. Analysis of phytoplankton and oceanographic sampling results from 2012-2015 has shown that *A. fundyense* concentrations are significantly correlated with both water temperature and salinity conditions and these results are being used to develop a public risk assessment tool for paralytic shellfish poisoning.
- In 2014 measurements at the continuous water quality stations showed that water temperatures in Kachemak Bay were warmer than the 10-year average for all months of the year and that trend is continuing in 2015. The last time the region experienced temperatures this warm was in 2005. From late May until early July 2015, KBRR and KBL phytoplankton sampling in Kachemak Bay detected bloom conditions for *Pseudo-nitzschia*, a phytoplankton species that can produce domoic acid toxins. The Kachemak Bay bloom dissipated in July, but concentrations increased again during the first two weeks of August 2015. A *Pseudo-nitzschia* bloom was observed along much of the U.S. West Coast and Gulf of Alaska coast, with shellfish closures and marine mammal deaths associated with elevated domoic acid levels on the West Coast. Toxin testing conducted by KBL and KBRR in partnership with other NOAA and State of Alaska offices in June and August 2015 found low levels of domoic acid levels in Kachemak Bay phytoplankton samples and mussel and sand lance tissues.
- We are collaborating with Gulf Watch Alaska and other trustee agency researchers to assess unusual seabird and marine mammal observations in summer 2015 and potential connections to anomalously warm Pacific Ocean waters. During summer 2015, Kachemak Bay and Cook Inlet have experienced above normal mortalities of common murres, as have other regions in the Gulf of Alaska. Most dead birds have been found in an emaciated condition. A significant increase in the number of dead whales observed in the western Gulf of Alaska also led NOAA to declare an unusual mortality event in August 2015 for whales in the region. In the Gulf of Alaska and the Aleutian Archipelago, colony nesting seabirds have had reproductive failure this summer. We will be using our oceanographic, plankton and seabird time series observations, with other Gulf Watch Alaska program observations, to help investigate potential causes of elevated seabird and whale mortalities in the Gulf of Alaska.
- The project leveraged partnerships with the Alaska Ocean Observing System and University of Alaska Fairbanks to collect water samples to quantify variability in water chemistry associated with ocean acidification.

- *Continuous plankton recorder –Sonia Batten, Sir Alister Hardy Foundation for Ocean Science (SAHFOS)*

Unusual plankton indices were evident from 2014 data, likely a result of the anomalous warming: The diatom data for 2014 are shown as a red dot on Figure 2, and do not fit with the significant relationship existing from 2000 to 2013 between diatom abundance and the Pacific Decadal Oscillation Index (PDO). The other anomalous year, lower left point in Fig.2, was 2011, which had very low diatoms thought to be due to increased cloud cover and/or high numbers of salps as noted by other researchers.

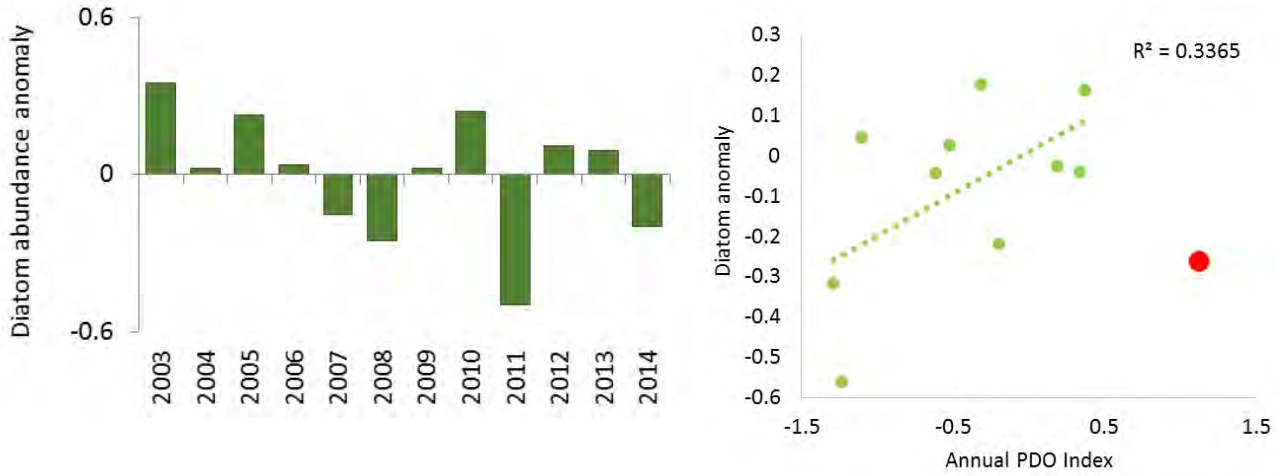


Figure 2. The left panel shows the annual diatom abundance anomaly for the shelf region, while the right hand panel shows the significant relationship between the annual mean PDO index and the diatom anomaly ($p<0.04$).

The seasonal cycle of zooplankton biomass on the Alaskan Shelf was normal in terms of timing, but late spring quantities were much higher than average in 2014, with June seeing the highest monthly mean value ever recorded in the time series. This resulted in one of the most positive annual zooplankton biomass anomalies for 2014.

Relationship between first year PWS Herring growth and CPR indices:
The time series of plankton on the Alaskan shelf, as indexed by the CPR, is not as lengthy as the time series of first year herring growth (dating back to 1979) from scale measurements. However, we have studied the decade when the time series overlap (Batten et al., in prep) and found that first year herring growth was greater in years with higher abundances of diatoms (Fig 3), microzooplankton and small mesozooplankton but not related to variability in abundance of larger mesozooplankton (such as euphausiids and large copepods). Furthermore, the strong relationship between diatoms and herring growth held true even in the warmest years where the relationship between temperature and growth broke down.

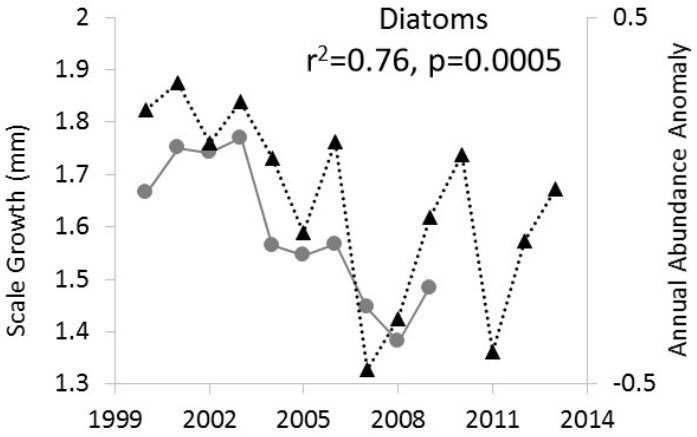


Figure 3. Time series of first year PWS herring scale growth (grey line and circles) and annual diatom abundance anomalies for the Alaskan shelf (black line and triangles). The strength of the relationship is indicated, and is highly significant. (Batten, et al., in prep.)

Pelagic monitoring component

- *Ability to detect trends in nearshore marine birds – Heather Coletti, USNPS Southwest Alaska inventory and monitoring Network (SWAN)*

The work for this project was completed in-house and reported in the Gulf Watch Alaska program synthesis report. Funds were returned to EVOSTC as the work was completed using National Park Service staff and funding.

Coletti, H. and T. Wilson. 2014. Nearshore Marine Bird Surveys: data synthesis, analysis and recommendations for sampling frequency and intensity to detect population trends. pgs. 3.53-3.60 in Hoem Neher et al. editors. Quantifying temporal and spatial ecosystem variability across the northern Gulf of Alaska. Science Synthesis report for the Gulf Watch Alaska Program, numbers 14120114 and 14120120. Exxon Valdez Oil Spill Trustee Council. Anchorage, Alaska.

- *Long-term killer whale monitoring – Craig Matkin, North Gulf Oceanic Society (NGOS)*

During this six month sampling period, we completed photoidentification for eight of the major resident pods including AB pod which has two new calves and now numbers 22 whales; all but one (AT6) of the AT1 transient individuals have been accounted for; and 23 Gulf of Alaska transients have been documented. There were 38 days of fieldwork during May and June. In addition, we completed collection of six biopsy samples across the early season period to examine changes in stable isotope levels over the season and over the years. Stable isotope levels appear to be dropping over decades indicate trophic shift in system or in diet of whales. We also collected 18 samples from sites of fish kills made by resident killer whales and observed and recorded predation of Gulf of Alaska transients on Dall's porpoise. Finally, we keep up with outreach of our project through our Facebook page with photos and updates from the associated with field-work. The page has generated up to 12,000 readers for some entries and regularly attracts a readership of over 2500 individuals per post.

- *Humpback whale predation on herring – John Moran and Jan Straley, NOAA National Marine Fisheries Service (NMFS) Auke Bay Laboratory and University of Alaska Southeast (UAS)*

Highlights from this year's surveys:

September 2014 Survey: We combined efforts with the Forage Fish Team and Winter Seabird Team For an intensive 2 vessel survey of hot spots.

December 2014 Survey: The prey field for humpback whales differed from previous surveys. The large aggregation of herring typically found in Port Gravina was not present. Adult herring and whales were still at the Latouche Island slide. Juvenile herring were abundant at all anchorages during the night. Other species were noticeably lacking.

April 2015 Survey: Herring schools were scattered relative to previous years. The whales were targeting small fast moving schools. Whales were also cueing on herring under feeding flocks of birds. Eight gulls were engulfed in one lunge.

- *Forage fish distribution and abundance –Mayumi Arimitsu and John Piatt, U. S. Geological Survey (USGS) Alaska Science Center*

During our sampling in 2015, capelin and young of the year walleye Pollock were sparse in Prince William Sound compared to previous years, possibly a result of the unusually warm ocean conditions observed in the Gulf of Alaska during spring and summer of 2015. As another possible sign of stress, we observed Pacific sand lance with signs of viral hemorrhagic septicemia (VHS) during the July 2015 field season. We have not encountered this in the past, and we sent sand lance samples in to the USGS disease lab for diagnostic testing.

- *Prince William Sound marine bird surveys – Kathy Kuletz, David Irons, and Robert Kaler, U.S. Fish and Wildlife Service (USFWS)*

Fiscal year 2015 was a non-survey year for the PWS marine bird surveys and no field component occurred this year. Progress was made in coordinating information transfer between the previous Project Leader (graduate student Daniel Cushing, Oregon State University) and the new Project Leader (Robb Kaler, Migratory Bird Management). Data management routines using Program R are being developed with specific scripts being written for quickly generating density estimates and 95% confidence intervals for marine birds in PWS.

- *Winter habitat use and distribution of sea birds in Prince William Sound, Mary Anne Bishop (PWSSC)*

We completed our winter surveys on schedule this year. Analyses completed based on surveys conducted over seven winters (November 2007 – March 2014), we have identified areas of high marine bird concentrations (Figure 1). Notably, northeast Prince William Sound, Montague Strait, and the southwest Passages are also areas where Humpback Whales concentrate. Similarly, Montague Strait is a known hotspot for Killer Whales. This suggests that in these areas environmental drivers such as currents and nutrients are creating persistent, favorable foraging conditions for marine birds and marine mammals.

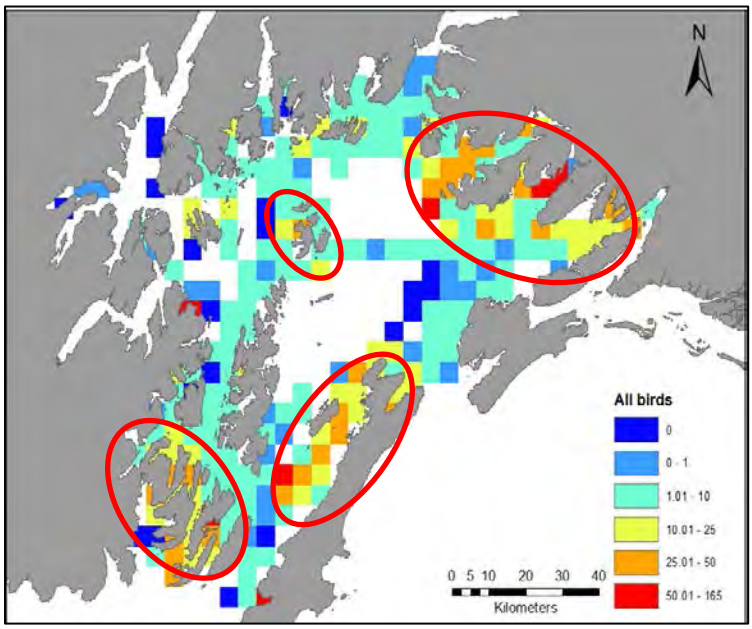


Figure 1. Average densities observed on fall/winter surveys within a 5 km x 5 km grid. November 2007 to March 2014, n = 27 surveys. White = not surveyed. Dark blue = surveyed but no birds observed

Densities of black-legged kittiwake, common murre, and marbled murrelet in PWS all vary significantly between November, January, and March, suggesting that multiple surveys are required to quantify wintering populations and understand changes in seabird distribution. Importantly, our results also suggest that historic surveys conducted across PWS in March (as in McKnight et al. 2006) have missed the winter peak in abundance for abundant winter species including marbled murrelet, glaucous-winged gull, and mew gull thus underestimating the importance of PWS as a wintering habitat.

Exploratory analyses using zero-inflated Poisson models found that glare and bin were useful for explaining the probability of excess zeros during surveys. Additionally, we found that winter, day of the season, habitat type, latitude, and longitude were important drivers of marine bird distribution in PWS.

Benthic monitoring component

- *Nearshore benthic systems in the Gulf of Alaska – USGS Alaska Science Center/ USNPS SWAN, Coastal Resources Associates*

Highlights from this year's monitoring work include:
Monitoring for sea star wasting syndrome: We have been cooperating with the MARINe nearshore monitoring program at the University of California to monitor for sea star wasting disease, which is a disease syndrome associated with massive die-offs of multiple sea star species along the North American Pacific coast. In 2014, at our GWA nearshore sites, we counted 1588 sea stars, 9 of which (0.6%) were damaged and potentially diseased. In June and July 2015, we noted that only 2 of 886 sea stars (0.2%) counted at our sites were damaged and potentially diseased. These data suggest that as of July 2015, sea star wasting disease was not widespread in the GOA and had not increased from summer 2014 to summer 2015.

Data provided for biological resources in area of grounded vessel: On April 21, 2015, the F/V Northern Pride caught fire and capsized northeast of Kodiak Island. The overturned hull was located offshore of KATM on April 28 and ran aground near Cape Chiniak by May 7, with oil sheen noted in the area. GWA Nearshore component team members were contacted to provide data on resources in the area that were at risk. Skiff surveys of marine birds and mammals and aerial surveys of sea otters have been conducted along the Katmai coast since 2006, and these data were provided to USFWS. The GWA/SWAN data sets include some of the most recent and comprehensive information on biological resources along the KATM coast.

Sea otter abundance at Katmai NPP: An aerial survey to estimate sea otter abundance was conducted along the Katmai coast in July of 2015. Preliminary analysis suggests an abundance estimate of 6,873 (SE = 959). Previous surveys were conducted in 2008 (7,095 SE = 922) and 2012 (8,644 SE = 1243). While the 2015 estimate is slightly lower than those from previous years, it does not differ significantly from 2008 and 2012 estimates and suggests that sea otter numbers at Katmai NPP are relatively stable.

- *Ecological Communities in Kachemak Bay – Katrin Iken and Brenda Konar, UAF*

Through the Gulf Watch Alaska LTM monitoring in Kachemak Bay, we verified that sea star wasting disease has reached the northern Gulf of Alaska. Additionally, we have confirmed that using aerial drones is a suitable tool to for otter feeding observations, and possibly also intertidal benthic habitat monitoring.

Lingering oil component

- *EVOS oil exposure of harlequin ducks and sea otters – Dan Esler and Brenda Ballachey, USGS Alaska Science Center*

The work for this project was completed and is reported in the program synthesis report and a final completion report has been submitted to EVOSTC.

Esler, D., J. Bodkin, B. Ballachey, D. Monson, K. Kloecker, and G. Esslinger. 2014. Timelines and mechanisms of wildlife population recovery following the Exxon Valdez Oil Spill. pgs. 5.6-5.17 *in* Hoem Neher et al. editors. Quantifying temporal and spatial ecosystem variability across the northern Gulf of Alaska. Science Synthesis report for the Gulf Watch Alaska Program, numbers 14120114 and 14120120. Exxon Valdez Oil Spill Trustee Council. Anchorage, Alaska.

- *Lingering oil level and weathering tracking – Mark Carls and Mandy Lindeberg, NOAA Auke Bay Laboratory*

The hydrocarbon retrospective analysis was completed and reported to the Gulf Watch Alaska program.
Abstract – Over the past quarter century, biomarkers persisted in sequestered oil in Prince William Sound and the Gulf of Alaska and remained identifiable with biomarkers. Pattern matching indicated the

presence of Alaska North Slope crude oil (ANSCO) over the entire observation period at most sites (7 of 8) and distinguished this source from several other potential sources. The presence of ANSCO was confirmed with Nordtest forensics. Biomarkers were conserved relative to other constituents, thus concentrations (per g oil) in initial beach samples were greater than those in fresh oil because they were lost more slowly than more labile oil constituents such as straight-chain alkanes and aromatic hydrocarbons. However, biomarker concentrations consistently declined thereafter (1989 to 2014), though loss varied substantially among and within sites. Isoprenoid loss was substantially greater than tricyclic triterpane, hopane, and sterane loss. Loss rates of the largest steranes tended to be least.

Field surveys for lingering oil were completed and results are being statistically analyzed. Oil samples collected in the field (sediments, gravimetrics, and PEMDs) are being analyzed in the laboratory. Hydrocarbon database maintenance and updates continue.

II. Coordination and Collaboration

A. Within the EVOS-funded Programs

A primary objective of the integrated Gulf Watch Alaska program is to coordinate cross-program monitoring, data management, outreach and administration. Below is a summary of current and proposed collaboration efforts within the Gulf Watch Alaska program, within each of the program components. Additional details can be found in the individual project reports provided separately from this document.

Gulf Watch Alaska Program Management, Outreach, and Administration Activities

- *Program coordination and logistics – Prince William Sound Science Center (PWSSC), Alaska Ocean Observing System (AOOS), and NOAA Kasitsna Bay Laboratory (KBL):* The Program Management Team (PMT consisting of Molly McCammon, Katrina Hoffman, Kris Holderied, and Tammy Neher) provides overall program coordination, with assistance from the Science Coordinating Committee (SCC) consisting of principal investigators from each of the four program monitoring components (Brenda Ballachey, Mandy Lindeberg, Russ Hopcroft, and Tom Weingartner). The science coordinator (Neher) will continue to work closely with PWSSC staff, the PMT and SCC to assist with overall administrative activities of the program, including developing reports, and planning meetings and events. The PMT works closely with the SCC to ensure that all of the program reporting needs are met, that there is consistency in how the data are collected, reviewed, and published, and that all members of the team are aware of the program administrative requirements. Finally, the PMT and SCC elected the program Science Review Panel in January, 2014 (Drs. Leslie Holland-Bartells, Hal Batchelder, Terrie Klinger, Stanley Rice and Mr. Eric Volk) to assist with scientific review of program documents such as sampling protocols and reports.
- *Data management –AOOS/Axiom Consulting:* The PMT and SCC work with Axiom staff to develop new data management and data access tools, including coordination of principal investigator (PI) data services requirements, participating in AOOS data access and visualization tool rating webinars and teleconferences, providing data and feedback for new access tools in the data portal, and providing feedback to improve metadata generation tools. The science coordinator works with all project principal investigators within the program to ensure new data is loaded to the data portal, has undergone quality assurance (QA)/quality control (QC) measures, and has appropriate metadata available for public access.
- *Historical data management and synthesis – National Center for Ecological Analysis and Synthesis (NCEAS):* The PMT and SCC facilitate communication between project principal investigators and NCEAS staff for historical data collection and synthesis and provide feedback for new data management tools and data publication.

- *Conceptual ecological modeling– Alaska Sea Life Center (ASLC):* The PMT and SCC work with ASLC staff to develop initial Gulf of Alaska ecological model and sub-model descriptions, coordinate model development and updates during program meetings and workshops, and incorporate information into the model.

Herring Research and Monitoring Program and Gulf Watch Alaska

The Gulf Watch Alaska PMT works closes with the Herring Research and Monitoring PIs to coordinate research activities, information, and reporting. This work is proposed to continue through the duration of the program and includes efforts such as:

- Sharing of vessel time and staff between HRM projects and GWA projects
- Attendance at meetings by staff from both the LTM and HRM programs
- Coordination of reporting documents and work plan development
- Sharing of expertise and analytical ideas between PIs in both programs
- Coordination of outreach tools and data sharing tools, such as the AOOS data portal, other outreach activities and metadata development tools.
- The aerial survey project is closely coordinated between the HRM program and forage fish project. Protocols, equipment, and expertise are shared between the two efforts. The aerial surveys also provided observations for the humpback whale project.
- The herring energetics and growth studies are working with the environmental drivers projects to determine if relationships between environmental conditions and herring growth can be detected.

Additionally, Gulf Watch Alaska scientists are working in their component teams to assist with development of a joint special journal issue in collaboration with the Herring Research and Monitoring team. A small committee of scientists from the program is working to select the journal and provide an initial framework for the issue. A workshop of co-authors of the papers will be a central focus of the programs' annual meetings held jointly in November 2015.

B. With Other Council-funded Projects

Dr. David Irons is one of the principal investigators of the PWS seabird monitoring project. Dr. Irons also coordinates his findings with the Pigeon Guillemot restoration research project in PWS (11100853-Am.8.29.13).

C. With Trustee or Management Agencies

With over $8 million dollars proposed in cost-share, in-kind, and direct funds, the Gulf Watch Alaska program could not be possible without extensive leveraging of resources by the trustee and management agencies that is proposed to continue through the duration of the program (see individual project proposals for details and cost-share sections of individual project budget forms). Some examples include direct fund support for the Cook Inlet oceanography, killer whale, CPR, and data management projects from AOOS, Sir Alister Hardy Foundation for Ocean Sciences, North Pacific Research Board, Norcross Wildlife Foundation, and Canadian Department of Fisheries and Oceans. Equipment, vessel time, and personnel support is provided to the humpback whale, forage fish, nearshore ecology in the Gulf of Alaska, and winter seabirds projects from NOAA Auke Bay Laboratory, USGS, USFWS, Alaska Department of Fish and Game, and the Ocean Tracking Network.

- *Outreach – AOOS:* The program's Outreach Planning Committee (consisting of team members from Alaska Sea Life Center, Kachemak Bay Research Reserve, Prince William Sound Science Center, Prince William Sound Regional Citizens Advisory Council, Alaska Sea Grant, Center for Ocean Science Education Excellence (COSEE) Alaska, North Pacific Research Board, U.S. Geological Survey (USGS), and NOAA National Marine Fisheries Service (NMFS) works with the program management team to develop materials and reports, and plan local events. The Outreach Team also

assists with annual updates to website pages and development of tools and review for publically accessible information working in close collaboration with Axiom Consulting and TerraGraphica.

- *Cook Inlet collaborations (NOAA Kasitsna Bay Laboratory, NPS, USFWS)*- Scientists in the Cook Inlet oceanography and nearshore benthic projects continue their collaboration with the *Bureau of Ocean Energy Management (BOEM)* to obtain additional funding to maintain quarterly oceanography surveys, provide seabird and marine mammals observers on the Cook Inlet surveys, and validate the NOAA/National Ocean Service (NOS) Cook Inlet ocean current circulation model. Scientists from NOAA Kasitsna Bay Laboratory, KBRR are also working with Axiom staff to use GWA monitoring data for a Harmful Algal Bloom (HAB) public website and advisory page.

III. PROGRAM DESIGN – Plan for FY16

A. Objectives for FY16

The objectives of the Gulf Watch Alaska program as proposed are:

1. Sustain and build upon existing time series in the EVOS-affected regions of the Gulf of Alaska.
2. Provide scientific data, data products and outreach to management agencies and a wide variety of users.
3. Develop improved monitoring for certain species and ecosystems.
4. Develop science synthesis products to assist management actions, inform the public and guide monitoring priorities for the next 20 years.
5. Enhance connections between the Gulf Watch Alaska and Herring Research and Monitoring (HRM) programs.
6. Leverage partnerships with outside agencies and groups to integrate data from broader efforts.

Please see detailed objectives for individual projects within their proposals within the Gulf Watch Alaska program.

B. Changes to Project Design

No changes are anticipated to the program; however there have been administrative changes within the Kachemak Bay Research Reserve (KBRR, project 16120114G) that will require some administrative adjustments. The KBRR transitioned to a new state partner, the University of Alaska Anchorage, and is no longer under the Trustee agency administration of Alaska Department of Fish and Game but Angela Doroff will remain the co-principal investigator on the project. The details of the transition are still being negotiated and will be worked through with the EVOSTC as they are finalized with the program management team.

IV. SCHEDULE

A. Program Milestones for FY16

Many of the program milestones are ongoing throughout the duration of the program with various dates of completion for project specific tasks for each year outlined in each individual project proposal. For consistency between all the projects, the program completion date for each year's monitoring work,

publication of the previous year's work, and associated reporting activities for the program is proposed to be the end of the project fiscal year, *January 31, 2017* unless otherwise noted.

Objective 1. Sustain and build upon existing time series in the EVOS-affected regions of the Gulf of Alaska.

Milestones:

- *Facilitate completion of data collection for year 5*
- *Ensure year 4 data is loaded and published from Ocean Workspace*
- *Continue to explore new partnerships and build upon developing collaborations (ongoing)*

Objective 2. Provide scientific data, data products and outreach to management agencies and a wide variety of users.

Milestones:

- *Publish all year 4 data to data portal*
- *Continue improvements to data portal including addition of data visualization tools (ongoing)*
- *Update website for all projects and new resources (April 31, 2016)*
- *Plan and support various outreach events as described in the Outreach project proposal– Molly McCammon (AOOS, 16120114-B)*
- *With concurrence of the Council, plan and prepare joint special issue with Herring Research and Monitoring program to be used as 5-year status summary, completion date to be decided upon through consultation with the Council staff.*

Objective 3. Develop improved monitoring for certain species and ecosystems.

Milestones:

- *Complete and propose monitoring plan for Forage Fish (Arimitsu and Piatt, project proposal, 16120114-O)*
- *Develop improved monitoring programs to reflect findings of marine birds trends analyses project (Ability to detect trends in nearshore marine birds – Coletti, NPS South West Alaska Network [SWAN], 16120114-F)*

Objective 4. Develop science synthesis products to assist management actions, inform the public and guide monitoring priorities for the next 20 years.

Milestones:

- *Solicit stakeholder input to develop improved data visualization and decision support*
- *Continue to improve and build upon public website and data portal*

Objective 5. Enhance connections between the Gulf Watch Alaska and Herring Research and Monitoring (HRM) programs.

Milestones:

- *Continue working collaboratively with HRM group, including participating in team meetings and work groups*
- *Continue cross-program collaborations for sampling, shared vessel time, and information, such as occurs with the forage fish, humpback whale, and winter seabird projects*
- *Develop joint special journal issue with HRM program*

Objective 6. Leverage partnerships with outside agencies and groups to integrate data from broader efforts.

Milestones:

- *Continue to build collaborations with outside entities such as NPRB, BOEM, ShoreZone, and University of Washington and new partners within AOOS, UAF, NOAA National Center for Coastal Ocean Services (NCCOS)work*

- *Continue efforts within small working groups to incorporate data sets from within and outside the GWA program into the historical data compiled and published by NCEAS*

B. Measurable Tasks for FY16

FY 15, 1st quarter (February 1, 2016 - April 31, 2016)

Through quarter:	*Winter Seabirds, Humpback Whale, Killer Whale, Lower Cook Inlet Oceanography, PWS Oceanography, CPR, Seward Line and GAK1 sampling completed (see Appendix 1 for details)*
Mar. 1:	*Annual project and program summary reports submitted*
Mar 1:	*Year 4 project data loaded and published on public data portal*
Mid-April:	*Hold quarterly program PI teleconference*
	Continue coordination for year 5 status summary report or special journal issue, in coordination with HRM lead and EVOSTC staff
April 1, 2016:	*Proposals for FY 2017-2021 due to EVOSTC*
April 31:	*Updates to program website for year 4 completed*

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

Through quarter:	*Killer Whale, Lower Cook Inlet Oceanography, PWS Oceanography, CPR, Seward Line, Nearshore Ecology in GOA, Kachemak Bay Benthic, Forage Fish, and GAK1 sampling completed.*
Dates TBD:	*Hold summer outreach events (ASLC, KBRR, PWSSC)*
Mid-July:	*Hold quarterly program PI teleconference*

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

Through quarter:	*Killer Whale, Lower Cook Inlet Oceanography, PWS Oceanography, CPR, Seward Line, GOA Seabirds, and GAK1 sampling completed (see Appendix 1 for details)*
September:	*Participate in EVOSTC science panel and public advisory committee meetings*

FY 16, 4th quarter (November 1, 2016- January 31, 2016)

Through quarter:	*Winter Seabirds, Humpback Whale, Killer Whale, lower Cook Inlet Oceanography, PWS Oceanography, CPR, Seward Line and GAK1 sampling completed (see Appendix 1 for details)*
November:	*Hold annual GWA PI meeting, Anchorage*
January:	*Participate in Alaska Marine Science Symposium*
January:	*Hold PI meeting at AMSS*
	Prepare for submission dates for sections of special issue with Herring Research and Monitoring program for 5-year status summary and concurrence with Council staff on completion date.

V. PROJECT PERSONNEL – Changes and Updates

New staff members were added for Hollmen, Conceptual Modeling (16120114-I) and Weingartner, GAK1 (16120114-P). Tammy Hoem Neher was added as a co-principal investigator to the science synthesis and coordination project (16120114H).Please see curriculum vitae for these new personnel included with the individual project proposals.

VI. BUDGET

A. Budget Forms

Please see attached workbook.

B. Changes from Original Proposal

An extension project was added and approved by the Council to secure a data coordinator position who will assist with the data management project for the Herring Research and Monitoring program as well as complete the dataONE national data publication piece of work. The funds awarded for this extension project were added to the tracking for the total Gulf Watch Alaska program budget for FY2015 and FY2016, providing an overall 5-year program budget increase of $247.8K including 9% GA from the previous program proposal.

One additional, important change is that under the Lower Cook Inlet and Kachemak Bay Oceanographic Monitoring project (15120114G), Kachemak Bay Research Reserve has transitioned administrative state partners from the Alaska Department of Fish and Game to the University of Alaska Anchorage. The details of the transition are still being negotiated and will be worked through with the EVOSTC as they are finalized with the program management team. This transition occurred just prior to this year's proposal submission and we will keep the Council informed if there are changes in project proposed budget that would include non-trustee agency overhead.

C. Sources of Additional Funding

This program is highly leveraged and subsidized from a wide range of sources. Approximately $1.4 million dollars will be provided as equipment/vessel sharing, personnel, and grants to the Gulf Watch Alaska projects in FY2016. In-kind and funding sources come from various entities, including Prince William Sound Science Center, AOOS, NOAA/NOS Kasitsna Bay Laboratory, NOAA/NMFS Alaska Fisheries Science Center and Northwest Fisheries Science Center, Alaska Sea Grant, BOEM, NOAA National Estuarine Research Reserve System (NERRS), USGS, USFWS, NPS, CIRCAC, ADF&G, Ocean Tracking Network, Canadian Department of Fisheries and Oceans, Sir Alister Hardy Foundation for Ocean Science, North Gulf Oceanic Society, Norcross Wildlife Foundation, and North Pacific Research Board.

Budget Category:	FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$1,212.5	$1,440.7	$1,462.2	$1,433.6	$1,417.1	$6,966.1	$0.0
Travel	$123.9	$108.5	$247.5	$242.9	$121.8	$844.6	$0.0
Contractual	$708.0	$544.0	$659.8	$649.3	$474.1	$3,035.2	$0.0
Commodities	$150.6	$130.7	$154.5	$122.4	$127.0	$685.2	$0.0
Equipment	$304.4	$27.8	$27.8	$20.3	$21.5	$401.8	$0.0
Indirect Costs (*will vary by proposer*)	$165.6	$202.3	$194.8	$214.9	$160.0	$937.7	$0.0
SUBTOTAL	$2,664.9	$2,454.1	$2,746.7	$2,683.4	$2,321.5	$12,870.6	$0.0
General Administration (9% of subtotal)	239.8	220.9	247.2	241.5	208.9	1158.4	0.0
PROGRAM TOTAL	**$2,904.74**	**$2,674.92**	**$2,993.88**	**$2,924.96**	**$2,530.44**	**$14,028.94**	**$0.00**
Other Resources (In-Kind Funds)	**$1,886**	**$1,738**	**$1,823**	**$1,902**	**$1,636**	**$8,916**	

COMMENTS: All amounts are give in 1000 dollars.

FY12-16

Program Title: 16120114 and 16120120
LTM - Long Term Monitoring
Team Leader:
Hoffman/McCammon/Holderied

SUMMARY

Note: includes change of $24,987. between NCEAS and Axiom per Gulf Watch Management Team memo dated July 5, 2012
Note: includes addition of $102,100. Ballachy and Esler - Lingering Oil for Harlequin Duck for FY14
Note: includes addition of $247.8 for AOOS/Axiom data coordinator project in FY2015-2016

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Long term monitoring: Environmental Drivers component – Long-term Monitoring of zooplankton populations on the Alaskan Shelf and Gulf of Alaska using Continuous Plankton Recorders.

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Sonia Batten, SAHFOS soba@sahfos.ac.uk and Robin Brown, PICES Robin.Brown@PICES.int

Study Location: Lower Cook Inlet, Gulf of Alaska shelf and adjacent open ocean.

Project Website: http://www.gulfwatchalaska.org/

Abstract*: Many important species forage outside of Prince William Sound for at least some of their life history (herring, salmon, birds and marine mammals for example) so an understanding of the productivity of these shelf and offshore areas is important to understanding and predicting fluctuations in resource abundance. The Continuous Plankton Recorder (CPR) has sampled a continuous transect extending from the inner part of Cook Inlet, onto the open continental shelf and across the shelf break into the open Gulf of Alaska monthly through spring and summer since 2004. There are also data from 2000-2003 from a previous transect. The current transect intersects with the outer part of the Seward Line and provides complementary large scale data to compare with the more local, finer scale plankton sampling on the shelf and in PWS. We are continuing to sampling this transect spring through fall each year with monthly resolution. Resulting data will enable us to identify where the incidences of high or low plankton are, which components of the community are influenced, and whether the whole region is responding in a similar way to meteorological variability. Evidence from CPR sampling over the past decade suggests that the regions are not synchronous in their response to ocean climate forcing. The data can also be used to try to explain how the interannual variation in ocean food sources creates interannual variability in PWS zooplankton, and when changes in ocean zooplankton are to be seen inside PWS. The CPR survey is a cost-effective, ship-of-opportunity based sampling program supported in the past by the EVOS TC that includes local involvement and has a proven track record.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$0.0	$66.8	$68.8	$70.7	$73.1	$279.5

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
	$94.7	$148.0	$180.8	$169.0	$592.5

** Figures given in $1,000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

The Continuous Plankton Recorder (CPR) transect samples the Alaskan shelf and crosses the slope into the open Gulf of Alaska, providing a record of taxonomically resolved near-surface zooplankton and large phytoplankton abundance over wide spatial scales. Many important species forage outside of Prince William Sound for at least some of their life history (herring, salmon, birds and marine mammals for example) so an understanding of the productivity of these shelf and offshore areas is important to understanding and predicting fluctuations in resource abundance. Our sampling transect extends from Cook Inlet to the open continental shelf, across the shelf break and into the open Gulf of Alaska in a continuous fashion (Figure 1), enabling us to identify where the incidences of high or low plankton are and whether the whole region is responding in a similar way to meteorological variability. Plankton are identified and counted so that community composition changes can be determined. Sampling is carried out monthly, spring through fall, so that changes in seasonal timing between years can also be detected. Results to date demonstrate a high degree of inter-annual variability, with sequential years often being substantially different. Timing of seasonal peaks, community composition and abundance of many groups of plankton each also often appear to be tied to physical forcing, suggesting that the productivity of the shelf region is likely controlled by bottom-up forcing. Recent anomalous warming across the wider Northeast Pacific was evident in unusual data from 2014 that are currently being worked up and are described briefly below. The physical forcing of plankton populations may also transfer climate variability to higher trophic levels through feeding. A manuscript is near submission which examines the links between plankton variability and PWS herring first year growth variability.

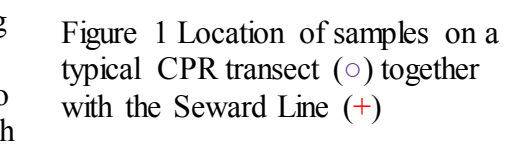


Figure 1 Location of samples on a typical CPR transect (○) together with the Seward Line (+)

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

The CPR survey is complimentary to the net sampling and oceanographic data collected elsewhere in the program by Hopcroft, Campbell, Holderreid and Doroff. Each of these PIs focusses on a localized region, sampling the water column there (the Seward line, PWS and lower Cook Inlet, respectively) while the horizontally-sampling CPR links these regions and provides a larger-scale, synoptic view of lower trophic level variability. Monthly sampling by the CPR also provides the within-year timing context for the less frequent Seward Line sampling, for example. The unique nature of CPR sampling, and the fact that a commercial vessel is the research platform means that it is not possible to share equipment or sampling with the other lower trophic level group members. The group however, has already produced a document outlining the different zooplankton sampling strategies and ways to conduct intercomparisons (appended to the annual report submitted earlier in 2014) and there is regular communication within the group regarding sampling issues and results.

B. With Other EVOSTC-funded Projects

Prior to its inclusion in the EVOSTC Long term Monitoring Program, the CPR was a part of the previous Herring Restoration Program. As such, Dr Batten maintains contact with the current Herring Program PI, Dr Pegau, and attends their project meetings at the Alaska Marine Science Symposium. During the last year we have been working on a joint manuscript which demonstrates the link between the plankton, as indexed by the CPR, and first year PWS herring growth.

C. With Trustee or Management Agencies

The North Pacific CPR Survey also receives support from the North Pacific Research Board, most recently as part of its new Long Term Monitoring Program beginning July 2014. The Canadian Department of Fisheries and Ocean also supports the southeast sample collection and results are fed into annual DFO "State of the Ocean" reports. CPR data are also annually included in the NOAA Ecosystems Considerations report.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

The fundamental goal of this program is to provide continued large spatial scale data on plankton populations to extend the existing time series and integrate the data with more regional, locally more intensive, sampling programs. More specifically, we will provide monthly (spring to fall – typically April to September) sampling in 2016 of zooplankton and large phytoplankton along the transect from the oceanic Gulf of Alaska to Cook Inlet, analyzing every 4th oceanic and every shelf sample to provide taxonomically resolved abundances. Temperature loggers have been fitted to CPRs since 2011 and we will maintain in situ temperature data collection on this transect in 2016.

B. Changes to Project Design

No Changes.

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. Sample collection on the transect from Cook Inlet to Puget Sound will begin in spring 2016 (likely April) and continue approximately monthly through to August/September 2016 (6 transects will be sampled). All shelf samples will be processed and every 4th oceanic sample. Along transect temperature data will be collected.
To be met by October 2016.

Objective 2. A subset of samples (25%) will be processed within 3 months of collection at the Institute of Ocean Sciences (DFO, Canada) and results from this processing (e.g. estimated mesozooplankton biomass and comparisons with data from previous years) will be available in progress reports and from the PI as soon as practicable. Full, quality controlled data from 2016 will be available by June 2017.
To be met within 3 months of sampling for subset data with full data available by June 2017.
Note that availability of full QC data is earlier than originally proposed, owing to more efficient protocols implemented at SAHFOS.

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

February:	Shipping of serviced CPR from UK to Horizon Kodiak
March/April:	First transect sampled
	Annual progress report for FY 15 submitted.
April:	Begin 2016 sample processing (ongoing hereafter)

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

May-July: 3 transects sampled
June: Final QC data from 2015 available
First results from 2016 sampling available (ongoing hereafter)

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

August-September: 2 transects sampled
October: CPR shipped back to UK for overhaul/repair.

FY 16, 4th quarter (November 1, 2016- January 31, 2017)

November: Attend annual PI meeting.
January: Attend Annual Science Symposium

V. PROJECT PERSONNEL – CHANGES AND UPDATES

PICES appointed a new Executive Director earlier this year, and so Robin Brown replaces Alex Bychkov as the PICES representative Primary Investigator on this project. A CV is appended at the end of this work statement.

VI. BUDGET

A. Budget Forms (Attached)

B. Changes from Original Proposal

No changes

C. Sources of Additional Funding

The North Pacific CPR Survey is funded by a consortium managed by the North Pacific Marine Science Organisation (PICES) and the Executive Director is a primary Investigator on this project. Members of the consortium comprise the EVOSTC, North Pacific Research Board (NPRB), Canadian Department of Fisheries and Oceans (DFO), Sir Alister Hardy Foundation for Ocean Science (SAHFOS) and Dr Sanae Chiba (JAMSTEC, Japan). Committed funding for the duration of this contract is given in the table below. Note that in addition to money DFO also provides laboratory and other facilities as in-kind support. Direct funds from DFO, NPRB and SAHFOS are used to fund sample collection and analysis, data analysis, travel, and report/manuscript writing. In-kind support by Dr Chiba covers analysis of western Pacific samples, freeing up the other funding for eastern Pacific sample analysis. SAHFOS in-kind support includes equipment, archiving and miscellaneous costs that ensure the sampling intensity is maintained.

Source	**FY**	**2016**	**2017**	***Notes***
DFO	Apr 1st to Mar 31st	$12,500		*Canadian $*
DFO	Apr 1st to Mar 31st	$10,000	$10,000	*In-kind support, Canadian $*
NPRB	July 1st to June 30th	$61,469	$63,680	*US$*
SAHFOS		$60,000	$60,000	*Estimated, includes salary support for S. Batten and in-kind support*
Dr Chiba		$37,500	$37,500	*Estimated in-kind support*

***Note the differing FY cycles of the different organisations which means the breakdown of funds between 2016 and 17 has been estimated*

Curriculum Vitae
Robin M. Brown

Personal Information

Full Name:	Robin Middleton Brown
Date of Birth:	July 18, 1954
Work Address:	North Pacific Marine Science Organization (PICES) P.O. Box 6000 9860 West Saanich Rd. Sidney, British Columbia V8L 4B2 ph: (250) 363-6364 fax: (250) 363-6827 email: Robin.Brown@pices.int

1976 Graduated from the University of British Columbia with a Bachelor of Science (Marine Biology) degree.

Employment:

February, 2015 – present	Executive Secretary, North Pacific Marine Science Organization (PICES)
August, 1999 to February, 2015	Division/Research Manager - Ocean Sciences Division at the Institute of Ocean Sciences Department of Fisheries and Oceans – Science Branch).
February, 1992 to August, 1999	Oceanographic Data Manager at the Institute of Ocean Sciences (Department of Fisheries and Oceans).
June, 1985 to January, 1991	Multidisciplinary Oceanographer with the Ocean Ecology Group at the Institute of Ocean Sciences (Department of Fisheries and Oceans).
May 1979-June 1985	Oceanographer with Seakem Oceanography Ltd., Sidney, B.C. (now AXYS Environmental Consulting Ltd.)
1976-1979:	Research Assistant - University of British Columbia

Awards and Recognition:

2012 - Deputy Minister's Commendation for efforts in support of the Cohen Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River.
2010 - Assistant Deputy Minister's Distinction Award for contributions to / coordination of the visit of the Emperor and Empress of Japan to the Institute of Ocean Sciences.
2009 - DFO Prix d'Excellence for contributions to the team that worked to have Bowie Seamount designated as a Marine Protected Area
1993 - Deputy Minister's Commendation for contributions to the Fisheries Management Information Study Team

International Experience:

North Pacific Marine Science Organization (PICES):

- Canadian delegate to the Governing Council (appointed in 2013)
- Member of the Finance and Administration Committee (appointed in 2012)
- Chair of the Advisory Panel on Status, Outlooks, Forecasts and Engagement (AP-SOFE) from 2009-2012. Continuing appointment as a member of this Advisory Panel since 2012.
- Chair of the Technical Committee on Data Exchange (TCODE) from 1995 – 2001. Continuing appointment as a member of this Committee since 2001.
- Chair of the Study Group on Ecosystem Status Reporting (2006-2007)
- Member of Science Board (1995-2001; 2009; 2012)
- Attended every PICES Annual Meeting since 1995 (PICES IV) and several other intersessional meetings and special PICES symposia
- Chairman of Local Organizing Committee for PICES-2007 in Victoria, B.C.

North Pacific Anadromous Fish Commission (NPAFC)

- Appointed as Lead Commissioner for Canada in 2013
- Lead Canadian representative on the Finance and Administration Committee.
- Elected as Vice- Chairman in May 2014

Coordinator – Visit of the Emperor and Empress of Japan to the Institute of Ocean Sciences (2007):
Canadian Representative – APEC Marine Resource Conservation Task Team (1995-1997)
Advisor – International GLOBEC Program – data management policy and practices (1994-1996)

Teamwork and Interagency Coordination:

Member of the Science Team providing analysis and advice to Fisheries and Oceans Canada for the Cohen Commission of Inquiry.
Co-chair of the Science and Monitoring Committee of the Federal-Provincial Japan Tsunami Debris Coordinating Committee (2012 – present).

Selected Publications and Reports

- Smith, J.N., **R.M. Brown**, W.J. Williams, M. Robert, R. Nelson and S.B. Moran. 2014. Arrival of the Fukushima radioactivity plume in North American continental waters. PNAS February 3, 2015 vol. 112 no. 5 pp. 1310-1315
- Chen, J., M.W. Cooke, J. Mercier, B. Ahier, M. Trudel, G. Workman, M. Wyeth and **R. Brown**. 2014. A report on radioactivity measurements of fish samples from the west coast of Canada. Radiat. Prot. Dosimetry .doi:10.1093/rpd/ncu150
- Lucas, B.G., Verrin, S., and **Brown, R**. (Editors). 2007. Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA). Can. Tech. Rep. Fish. Aquat. Sci. 2667: xii + 105 p
- Gargett, A. E., M. Li, and **R. Brown.** 2001. Testing the mechanistic explanations of observed correlations between environmental factors and marine fisheries. Can. J. Fish. Aquat. Sci. 58:208-219
- Gargett, A. E., M. Li, and **R. Brown**. 1998. Testing the Concept of an Optimal Stability 'Window'. *in* Holloway, G., P. Muller and Diane Henderson (ed.) 'Aha Huliko'a: Biotic Impacts of Extratropical Climate Variability in the Pacific. SOEST Special Publication-1998

- Mackas, D.L., R. Keiser, M. Saunders, D. R. Yelland, **R.M. Brown** and D.F. Moore. 1997. Aggregation of euphausiids and Pacific hake (*Meluccius productus*) along the outer continental shelf off Vancouver Island. Can. J. Fish. Aquat. Sci. 54:2080-2096.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$0.0	$31.8	$32.7	$33.8	$35.0	$133.3	
Travel	$0.0	$1.0	$1.0	$1.0	$1.1	$4.1	
Contractual	$0.0	$7.2	$7.4	$7.5	$7.9	$30.0	
Commodities	$0.0	$4.5	$4.7	$4.8	$4.8	$18.8	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (will vary by proposer)		$16.8	$17.3	$17.8	$18.3	$70.2	
SUBTOTAL	$0.0	$61.3	$63.1	$64.9	$67.1	$256.4	
General Administration (9% of subtotal)	$0.0	$5.5	$5.7	$5.8	$6.0	$23.1	
PROJECT TOTAL	$0.0	$66.8	$68.8	$70.7	$73.1	$279.5	
Other Resources (in kind Funds)	$0.0	$94.7	$148.0	$180.8	$169.0	$592.5	

COMMENTS:The North Pacific CPR survey is supported by a Consortium managed by the North Pacific Marine Science Organisation, of which the EVOS TC is a member. Costs included here are 40% of the full costs of acquiring data along the north-south transect. The remining funds come from the consortium which currently includes the NPRB ($30,000 in FY2014), Canadian Dept Fisheries and Oceans ($25,000 in FY 2014) and SAHFOS ($39,700 in FY2014).

FY12-16

Program Title:16120114-A CPR
Team Leader: S. Batten

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
S Batten	Long term monitoring of zooplankton	1.2	8.2		9.8
Doug Moore	populations on the Alaskan Shelf and Gulf	1.4	6.1		8.5
Technicians - workshop	of Alaska using Continuous Plankton recorders	0.3	5.9		1.8
Technicians - analysts		2.0	5.6		11.2
D Stevens		0.3	6.3		2.0
P Pritchard		0.2	8.2		1.6
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	40.3	0.0	
				Personnel Total	$35.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
Portion of PI's travel to Alaska marine Science meeting and PICES annual					1.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.1

FY16

Program Title:15120114-A CPR
Team Leader: S. Batten

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
Portion of local CPR servicing in Anchorage	2.7
Portion of CPR leasing	3.7
Portion of computing services	0.2
Portion of website maintenance by PICES	0.5
Portion of tow payment to ship	0.8
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	7.9

Commodities Costs:	Commodities
Description	Sum
lab consumables	0.8
Shipping of gear	1.3
shipping of samples	0.4
filtering mesh	1.8
Tow wires	0.5
Commodities Total	4.8

FY16

Program Title:15120114-A CPR
Team Leader: S. Batten

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency
existing CPRs will be used. Lease costs charged above cover replacement/repair		
external bodies	1	
internal mechanisms	4	
Existing microscopes will also be used, (including one purchased in FY03)	7	

FY16

Program Title:16120114-A CPR
Team Leader: S. Batten

FORM 3B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Long term monitoring: Program management component – Administration, Science Review Panel and PI Meeting Logistics, and Outreach and Community Involvement

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Katrina Hoffman, Prince William Sound Science Center (PWSSC) and Molly McCammon, Alaska Ocean Observing System (AOOS)

Study Location: Prince William Sound, Lower Cook Inlet, Resurrection Bay and Gulf of Alaska. Administrative services are conducted at the PWSSC office in Cordova. Science review and PI meetings are held in Anchorage or elsewhere in the EVOS region. Outreach and community involvement activities may be conducted throughout the EVOS region.

Project Website: www.gulfwatchalaska.org

Abstract*: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et al. To achieve fiscal efficiency, the Prince William Sound Science Center (PWSSC) serves as the administrative lead and fiscal agent for the consortium implementing this program known as Gulf Watch Alaska (GWA). As fiscal agent and administrative lead, PWSSC is responsible for: managing award contracts for all non-Trustee Agency projects within the program; ensuring the program and projects adhere to all reporting policies, practices and timelines as required by the EVOSTC and NOAA; serving as a liaison between the program and EVOSTC staff; coordinating travel and logistics for principal investigator annual meetings; coordinating travel and logistics for outreach efforts; participating in an annual audit; and providing administrative support to the outreach and community involvement component of the GWA program. The Outreach and Community Involvement component is coordinated by the Alaska Ocean Observing System. We also coordinate with the Herring Research and Monitoring Program on data sharing, administration and outreach.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$263.3	$274.7	$298.6	$293.4	$288.1	$1418.2

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL

** Funds expressed in $1000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

Please provide a summary of the project including key hypotheses and overall goals, as submitted in your original proposal. If there are additional highlights that you would like to include since you submitted your annual report, please include them here. Also, please list any publications that have been submitted and/or accepted since you submitted your annual report.

The EVOS Trustee Council requested that a consortium submit one proposal for the GWA program. Three organizations in the consortium comprise the Program Management Team (PMT): PWSSC is the administrative lead and fiscal agent; NOAA's Kasitsna Bay Laboratory (KBL) is the science program lead and sponsors the science coordinator, and the Alaska Ocean Observing System (AOOS) provides data management and outreach and community involvement services. AOOS also serves as the overall Team Lead and primary point of contact for the program. Collectively, this consortium brings a wealth of knowledge about the spill-affected region, has extensive experience with managing multi-million dollar science programs with multiple partners, and has the capacity to leverage significant additional dollars.

This administrative project completes annual audits; establishes and manages contracts to all non-Trustee agency organizations funded through this program; completes fiscal reporting; supports activities of the Scientific Review panel, including travel and logistics when necessary; sets up logistics for and supports annual PI meetings; provides travel and logistics support to the Outreach Steering Committee; and tracks Outreach and Community Involvement activities coordinated by PI McCammon. For details about Outreach and Community Involvement, please see McCammon's project proposal form.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

PWSSC submits progress reports to NOAA for all projects funded through this program. We submit fiscal reports to NOAA for all non-Trustee agency projects funded through this program. We coordinate the annual meeting for all Trustee and non-Trustee agency projects funded through this program. We issue subaward contracts to all non-Trustee agency projects funded through this program. These contracts are to the Univ. of Alaska Fairbanks (Hopcroft, Weingartner, Konar, Ikens), SAHFOS (Batten), North Gulf Oceanic Society (Matkin), Alaska SeaLife Center (Hollmen), Alaska Ocean Observing System/Axiom Consulting (McCammon/Bochenek), and Alaska Ocean Observing System (McCammon). We regularly engage with Scott Pegau, Coordination and Logistics principal investigator of the EVOSTC-funded Herring Research and Monitoring (HRM) program to ensure that both programs are sharing information about data, projects, and administrative requirements. Members of the GWA Program Management Team attend HRM PI meetings and vice versa. Aerial surveys are coordinated between the two programs to maximize benefits to multiple projects. GWA provides data on environmental conditions and other factors relevant to HRM projects and synthesis work.

B. With Other EVOSTC-funded Projects

None proposed for this project

C. With Trustee or Management Agencies

None proposed for this project

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

Identify the primary objectives for your project for FY16 as submitted in your original proposal.

Objective 1 **Fiscal management tasks**

a. Award and management of all contracts and sub awards for non-Trustee organizations involved in this program (this totals 9 investigators among 6 contracts[1] in addition to 2 PWSSC projects)—ongoing
b. Timely submission of financial reports—ongoing
c. Completion of annual audits—scheduled for November 2016
d. Monitoring of project spending—ongoing

The budget assumes that funding to Trustee Agencies is provided directly to that agency and not through PWSSC. The PWSSC awards contracts to all non-Trustee organizations involved in this proposal, with two exceptions for two co-PIs who are working with Trustee agency projects (Straley from University of Alaska Southeast and Dean from Coastal Resources Associates). Straley and Dean's participation are included as contracts within, respectively, the Moran (NOAA) and Ballachey (USGS) Trustee agency project DPDs and budgets.

Objective 2 **Formation and operation of a scientific review panel**

Costs associated with the formation and operation of a scientific review panel for the LTM program are included in the administrative fee. These costs include administrative assistance and travel arrangements and expenses. The scientific review panel is continuing their activities and PWSSC supports their travel to meetings, meetings, and teleconferences as needed.

Objective 3 **Travel expenses for the Annual Meeting of GWA PIs**

This includes coordination of all logistics in support of annual PI meetings as well as the provision of a teleconference line for all teleconferences in the interim. Annual meetings are typically in November.

Objective 4 **Travel expenses for Outreach Team***

Administrative assistance and travel arrangements and expenses for activities directed by the Outreach and Community Involvement Team, led by McCammon, are included in this project.

Objective 5 **GWA Project Outreach and Community Involvement***

This includes McCammon coordination of the steering committee; PWSSC logistics support for meetings; and management of any contracts through which outreach activities are funded.

**For more details about Outreach and Community Involvement, please see McCammon's project proposal form.*

B. Changes to Project Design

If the project design has changed from your original proposal, please identify any substantive changes and the reason for the changes. Include any information on problems encountered with the research or methods, if any. This may include logistic or weather challenges, budget problems, personnel issues, etc. Please also include information as to how any problem has been or will be resolved. This may also include new insights or hypotheses that develop and prompt adjustment to the project.

There are no substantive changes to project design. However, the travel budget category has not been spent down as initially planned. This is due to several reasons, including: PIs used funds within their own budgets or from other related projects to cover travel to some meetings; and the Scientific Review Panel was formed later in the program than anticipated in the original proposal (this delay was explicitly

[1] Six contracts have awarded to the Univ. of Alaska Fairbanks (Hopcroft, Weingartner, Konar, Iken), SAHFOS (Batten), North Gulf Oceanic Society (Matkin), Alaska SeaLife Center (Hollmen), Alaska Ocean Observing System through Axiom Consulting (McCammon/Bochenek), and Alaska Ocean Observing System (McCammon).

agreed-upon). We request a no-net-budget-impact shift between budget categories to move $150K in previous fiscal year carry-over funds from travel to contractual, a category in which we have responsibility for things such as aerial surveys, maintenance, etc.

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. Fiscal management tasks

a. Award and management of all contracts and sub awards for non-Trustee organizations involved in this program
Updated contracts are issued at the beginning of each project year—to be met in February 2016. Contract management is ongoing throughout the award year.

b. Timely submission of financial reports
Submitted to NOAA by 4/30/16 and 10/30/16; budget reports are submitted to EVOSTC with annual report package by 3/1/16 with the following year's work plan proposal submitted by 9/1/16.

c. Completion of annual audits
To be conducted in November 2016 with analysis completed by February 2017.

d. Monitoring of project spending
This is continuous throughout the duration of the project.

Objective 2. Formation and operation of a scientific review panel
Scientific review panel activities are ongoing throughout the remainder of the project. Review Panel members will participate in one or more of the PI meetings.

Objective 3. Travel expenses for the Annual Meeting of GWA PIs
This will be done as needed for the annual PI meeting, which is tentatively planned for November 2016, as well as a gathering at the January 2017 Alaska Marine Science Symposium. Funds will also support select PI travel to report on their projects in communities in the EVOS spill-affected region.

Objective 4. Travel expenses for Outreach Team*
Completion of this objective is ongoing; expenses are covered as accrued during the project year.

Objective 5. GWA Project Outreach and Community Involvement*
Completion of this objective is ongoing; expenses are covered as accrued during the project year.

**Details can be found in the McCammon proposal form.*

B. Measurable Project Tasks for FY 16

Specify, by each quarter of each fiscal year, when critical project tasks (for example, sample collection, data analysis, manuscript submittal, etc.) will be completed, as submitted in your original proposal. Please identify any substantive changes and the reason for the changes. Please format your schedule as in the following example:

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)
February: Contracts amended to reflect new fiscal year
March 1: Submit Year 4 annual reports
April: Fiscal report submitted to NOAA
Feb-April: Prepare next 5-year proposal.

April 1: Submit FY17-21 GWA program proposal.

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)
May: Attend HRM PI meeting if scheduled.

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)
September 1: If offered the opportunity, submit final FY17-21 GWA program proposal.
October: Fiscal report submitted to NOAA.
November: Travel and logistics for annual PI meeting.
Attend EVOS Trustee Council and Public Advisory Committee meetings, when held.

FY 16, 4th quarter (November 1, 2016- January 31, 2017)
November: Annual PI meeting. Conduct annual audit.
January: Host meeting at Alaska Marine Science Symposium
Prepare summative report on monitoring efforts in the FFY 12-16 GWA/LTM program

V. PROJECT PERSONNEL – CHANGES AND UPDATES

No changes.

VI. BUDGET

A. Budget Forms

See completed budget forms.

B. Changes from Original Proposal

We do not seek changes for the FY16 administrative funds as originally proposed. We request permission to move $150K from the travel category to the contractual category. This proposed shift has no net impact on the overall approved budget. There are travel carry-over funds from previous fiscal years. Moving funds to the contractual category, a category in which we have responsibility for things such as aerial surveys, maintenance, etc., will allow us to advance program objectives. Travel is underspent due to PIs using different sources than originally planned to attend some meetings such as AMSS, and the (agreed-upon, purposeful) delayed initiation of the Scientific Review Panel, and lower Outreach Steering Committee travel than originally expected.

C. Sources of Additional Funding

Not applicable for administrative aspects of the program.

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Outreach and Community Involvement* (budget is component of overall Administration Project)

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Molly McCammon, AOOS

Study Location: Entire project area

Project Website: www.gulfwatchalaska.org

Abstract*:
The overall goal of the Outreach and Community Involvement component is to provide education and outreach materials to communities in Prince William Sound and lower Cook Inlet and other stakeholders and resource managers highlighting the scientific information and knowledge gained through the Gulf Watch Alaska program. The component is led by Molly McCammon, Executive Director of the Alaska Ocean Observing System, and guided by a Steering Committee that includes key outreach staff from AOOS, the PWS Science Center (PWSSC), Prince William Sound Regional Citizens Advisory Council (PWSRCAC), Kachemak Bay Research Reserve (KBRR), Alaska SeaLife Center (ASLC), North Pacific Research Board (NPRB), COSEE Alaska (COSEE), NOAA and USGS. Marilyn Sigman, a marine educator with Alaska Sea Grant, is now providing some additional staff support to our outreach efforts. The Steering Committee meets regularly throughout the year. Activities include development of basic communication and branding materials, a programmatic website and data portal, community lectures in Cordova and Homer, and public Discovery Labs in Homer.

Estimated Budget: Budget is not detailed here; Outreach project activities are overseen by PI McCammon but the funds are a component of PI Hoffman's program administration budget.

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL

**If the amount requested here does not match the amount on the budget form, the request on the budget form will considered to be correct.*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

The overall goal of the Outreach and Community Involvement component is to provide education and outreach materials to communities in Prince William Sound and lower Cook Inlet and other stakeholders and resource managers highlighting the scientific information and knowledge gained through the Gulf Watch Alaska program. Since the March 1 annual report, an August Discovery Lab in Homer reached 207 people. The Summer 2015 Delta Sound Connections newspaper included a 2-page section highlighting the GWA program and project results and was circulated throughout Prince William Sound communities as well as at key locations in Anchorage, Girdwood, Whittier, Valdez and the Copper River basin communities that are visited by travelers on their way to Prince William Sound. Project PIs have also made numerous presentations to communities and stakeholders throughout the oil-spill-affected areas. Other outreach projects are underway, including an exhibit at the Alaska SeaLife Center and a "virtual field trip" of online instruction for middle school students featuring the GWA program components and results and the work and careers of project scientists.

II. COORDINATION AND COLLABORATION

A. Within a EVOSTC-Funded Program

The GWA Program Management Team actively participates in the Outreach and Community Involvement Steering Committee to ensure all activities are coordinated and integrated within the entire GWA Program. Outreach activities are regularly reported on during all PI and Science Coordinating Committee meetings.

B. With Other EVOSTC-funded Projects

Not currently applicable, but we plan to explore future collaborations with the marine debris project.

C. With Trustee or Management Agencies

The Outreach component works closely with the U.S. Department of the Interior, U.S. Forest Service (in Cordova) and NOAA outreach/communication specialists (two serve on the Steering Committee) in order to leverage existing agency outreach activities.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

a) Continue outreach and information dissemination efforts at community level events, workshops, and scientific meetings.
b) Develop new projects including scientific mini-symposia and film festivals, virtual field trip and curriculum, and exhibit.
c) Follow-up on initial actions to inform agency managers and to explore opportunities for Community Based Monitoring.

B. Changes to Project Design

Based on the successful completion of two student film workshops in Nanwalek and Port Graham and the anticipated completion of a Virtual Field Trip and exhibit by the Alaska SeaLife Center in FY15, we are planning a third student film workshop in Cordova, a second Virtual Field Trip, and the development of a portable or "desktop" exhibit based on the one to be installed at ASLC that can travel to museums in Valdez, Homer, and Cordova. We will also continue efforts to develop scientific mini-symposia for smaller communities and their schools, and hold another webinar for agency managers. *These activities will have no net impact on the originally-requested budget for this component of Project Administration.*

IV. SCHEDULE

A. Project Milestones for FY16

Objective 1. Continue outreach and information dissemination efforts at community level events, workshops, and scientific meetings.

Ongoing. To be met by January 2017

Objective 2. Develop additional outreach projects including scientific mini-symposia and film festivals, virtual field trip and curriculum, and a traveling exhibit.

To be met by January 2017

Objective 3. Follow-up on initial actions to inform agency managers and to explore opportunities for Community Based Monitoring.

To be met by January 2017

B. Measurable Project Tasks for FY16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

March 31: Cordova Student Film-making Workshop & Community Film Night completed

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

April 30: Delta Sound Connections newspaper completed; distribution begins
June 30: Website updated with highlights from March 1 2016 annual reports
July 30: Agency webinar completed

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

August: GWA-centric Discovery Lab at KBRR, Homer
September: Second Virtual Field Trip completed by ASLC
October: Traveling exhibit completed by ASLC

FY 16, 4th quarter (November 1, 2016- January 31, 2017)

January: Sponsor speakers at AK Marine Science Symposium

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Marilyn Sigman, a marine educator, formerly with the COSEE Program that ended in July 2015, continues to provide additional staff support to our outreach efforts in her on-going position as Alaska Sea Grant's marine education specialist.

VI. BUDGET

A. Budget Forms

Provided in Hoffman, Program Administration project 16120114-B

B. Changes from Original Proposal

No changes from the original proposal are requested.

C. Sources of Additional Funding

No additional funding anticipated

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$118.8	$122.4	$130.4	$127.3	$129.9	$628.8	
Travel	$48.3	$51.6	$55.6	$59.7	$61.7	$276.9	
Contractual	$69.5	$75.0	$84.5	$81.2	$70.2	$380.5	
Commodities	$5.0	$3.0	$3.4	$1.0	$2.5	$14.9	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (*will vary by proposer*)	waived	waived	waived	waived	waived	waived	
SUBTOTAL	$241.6	$252.1	$273.9	$269.2	$264.3	$1,301.1	
General Administration (9% of subtotal)	$21.7	$22.7	$24.7	$24.2	$23.8	$117.1	
PROJECT TOTAL	$263.3	$274.7	$298.6	$293.4	$288.1	$1,418.2	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	0

COMMENTS: PWSSC proposes a flat rate in lieu of its federal recognized IDC rate. This $200K itemized budget includes expenses that would normally be charged to IDC, and ALSO INCLUDES travel and meeting setup costs that are direct program charges. We do not seek changes for the FY16 administrative funds as originally proposed. We request permission to move $150K from the travel category to the contractual category. This proposed shift has no net impact on the overall approved budget. There are travel carry-over funds from previous fiscal years. Moving funds to the contractual category, a category in which we have responsibility for things such as aerial surveys, maintenance, etc., will allow us to advance program objectives. Travel is underspent due to PIs using different sources than originally planned to attend some meetings such as AMSS, and the (agreed-upon, purposeful) delayed initiation of the Scientific Review Panel, and lower Outreach Steering Committee travel than originally expected.

FY12-16

Program Title: 16120114-B Administration and Meeting Travel/Logistics
Team Leader: Hoffman

SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Exec Director		2.0	13.6		27.2
Finance Director		3.0	9.1		27.3
Bookkeeper		7.0	6.2		43.4
Admin. Assistant		2.5	5.0		12.5
IT support		2.5	7.8		19.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	41.7	0.0	
				Personnel Total	$129.9

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Adminstrative staff Cordova to Anchorage	0.5	2	2	0.2	1.4
Travel for Science/Technical Committee review meetings					12.0
Travel for Outreach & Communications meetings & activities					22.0
Travel for LTM Annual Project mtg in Anchorage - 15 P.I.s plus 2 nights					18.0
Support for KRRB, ASLC, PWSSC/OSRI reps to attend TC PAC mtg	0.400	3	1.0	0.100	1.3
Two annual P.I. mtgs (herring & LTM) - outreach representatives travel	0.400	6	1.5	0.175	2.7
Regional science symposiums - attendance by outreach representatives	0.400	10	2.0	0.175	4.4
					0.0
					0.0
					0.0
					0.0
				Travel Total	$61.7

FY16

Program Title: 16120114-B Administration and Meeting Travel/Logistics
Team Leader: Hoffman

FORM 3B PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
Meeting space rental for LTM Annual Project Meeting in Anchorage	1.0
Mini-grant program to support activities directed by Outreach Team	25.0
Develop project profiles 6 each year @ $1,000 each	6.0
Participate in *Delta Sound Connections* annual publication	2.0
AOOS personnel support for facilitation of project	6.0
Shared costs through the PWSSC:	
Electricity @$450/month	5.4
Office space rent @ $690/month	8.3
Vehicle use in Cordova	1.0
Postage @ $75/month	0.9
Audit (total cost estimated at $20K)	10.0
Insurance (total cost estimated at $30K)	2.0
Telephone @ $220/month	2.6
Contractual Total	$70.2

Commodities Costs:	Commodities
Description	Sum
Misc. office supplies	1.0
Computer and/or software	1.5
Commodities Total	$2.5

FY16

Program Title: 16120114-B Administration and Meeting Travel/Logistics
Team Leader: Hoffman

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY16

Program Title: 16120114-B Administration and Meeting Travel/Logistics
Team Leader: Hoffman

FORM 3B
EQUIPMENT DETAIL

FY16 PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

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

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Mary Anne Bishop, Ph.D., Prince William Sound Science Center, Cordova
mbishop@pwssc.org

Study Location: Prince William Sound

Project Website: www.Gulf Watch Alaskaalaska.org http://pwssc.org/research/birds-2/seabirds/

Abstract: This project is a component of the integrated Gulfwatch Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et.al. The vast majority of seabird monitoring in areas affected by the *Exxon Valdez* oil spill has taken place around breeding colonies during the reproductive season, a time when food is generally at its most plentiful. However, seabirds spend most of the year widely dispersed. Late fall through winter are critical periods for survival as food tends to be relatively scarce or inaccessible, the climate more extreme, light levels reduced, day length shorter and water temperatures colder. Post-spill ecosystem recovery and changing physical and biological factors all have the potential to affect PWS seabird populations. Of the seabirds that overwinter in PWS, nine species were initially injured by the *Exxon Valdez* oil spill, including three species that have not yet recovered (marbled murrelet, Kittlitz's murrelet and pigeon guillemot). Here we propose to continue to monitor from 2012 through 2016 seabird abundance, species composition, and habitat associations using multiple surveys (up to 5 surveys per season) during late fall and winter. The data will improve our predictive models of seabird species abundance and distribution in relation to biological and physical environmental factors. In addition, by monitoring the top-down forcing by seabirds, a major source of herring predation, this project will complement the suite of *PWS Herring Research & Monitoring* studies, including improved mortality estimates for herring population models. This project is part of the pelagic component within the integrated *Gulf Watch Alaska Long-term Monitoring of Marine Conditions and Injured Resources and Services* submitted by McCammon *et. al.* Our project uses as observing platforms the vessels associated with the *LTM Humpback Whale surveys, PWS Herring Research & Monitoring Juvenile Herring Abundance Index* and integrates the seabird observations with those studies. In addition, our projects uses vessels associated with Alaska Dept. of Fish and Game October PWS shrimp surveys, and PWS Science Center February acoustic array cruises.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$51.7	$78.6	$80.9	$83.4	$86.3	$380.9

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$10.5	$45.5	$63.5	$63.5	$63.5	$246.5

**Figures given in $1,000 increments*

Date: August 31, 2015

I. EXECUTIVE SUMMARY

Of the seabirds that overwinter in Prince William Sound (PWS), nine species were initially injured by the *Exxon Valdez* oil spill, including three species that have not yet recovered (marbled murrelet, Kittlitz's murrelet and pigeon guillemot. Nevertheless, the vast majority of seabird monitoring in areas affected by the Exxon Valdez oil spill has taken place around breeding colonies during the reproductive season, a time when food is generally at its most plentiful. Long-term monitoring of seabirds in PWS during winter is needed to understand how post-spill ecosystem recovery and changing physical and biological factors are affecting seabird abundance and species composition, as well as their distribution and habitat use.

This study is a continuation of systematic late fall and winter seabird surveys begun in 2007 by Bishop and Kuletz. Between October 2011 and February 2015, a seabird observer participated in 18 late fall and winter cruises. These include 14 cruises associated with four EVOS-funded projects: Gulf Watch Alaska *Humpback Whale systematic surveys* (n = 8), PWS Herring Survey *Hydroacoustic Juvenile Herring Surveys* (n = 2), Herring and Research Monitoring *Juvenile Herring Abundance Index* (n = 3), and Herring and Research Monitoring *Expanded Adult Herring Surveys* (n = 1), as well as 2 cruises with Alaska. Department of Fish and Game (ADFG; Oct 2013 & 2014) and 2 cruises with PWS Science Center Ocean Tracking Network (OTN) project (Feb 2014 & 2015). We plan to continue placing an observer onboard the October ADFG and the February PWS Science Center OTN cruises. At the end of first 5 years of the long-term monitoring (September 2016), this study will have monthly data sets from broad-scale coverage of PWS ranging from 4 to 10 years.

We continue to use the same methodology on our cruises that we have used since November 2007. That includes a 300m transect width (150 m each side), and recording all observations into dLog software. Data analyses are ongoing. Data is stored in the form of a Microsoft access database and metadata is available. All milestones have completion dates in 2016.

We collaborated with two EVOS *Gulf Watch* studies (*Humpback whale predation on Pacific herring* and *Forage fish in PWS*) and one EVOS *Herring* study (*Validation of Acoustic Surveys for Pacific Herring Using Direct Capture*) to investigate fall movements of whales, fish, and birds into the Sound via Montague Strait during September 2014. Humpback whales may take advantage of seabird feeding activity by using feeding flocks of marine birds as visual cues to prey concentrations. To characterize these relationships between marine predators and their prey resources, we recorded marine bird observations concurrent with humpback whale surveys and hydroacoustic transects.

In 2014 we contracted with Quanticipate Consulting (Dr. Ali Arab) to assist us with modeling temporal and spatial trends of seabirds in winter while accounting for sampling issues including detection probability estimation. Results will be provided in tables and figures for constant and temporally-varying variables and in form of maps for spatially-varying estimates.

2015 Publications:

Bishop, M.A., J. Watson, K. Kuletz, and T. Morgan. 2015. Pacific herring consumption by marine birds during winter in Prince William Sound, Alaska. *Fisheries Oceanography* 24:1-13.

Dawson, N., M.A. Bishop, K. Kuletz and A. Zuur. 2015. Using ships of opportunity to assess winter habitat associations of seabirds in subarctic coastal Alaska. *Northwest Science* 89(2):111-128.

EVOS Science Syntheses for Gulf Watch:

Bishop, M.A. 2014. Research summary: Long-term monitoring of seabird abundance and habitat associations during late fall and winter in Prince William Sound. pp 3-70 to 3-78.

Popular press:

Schaefer, A. 2015. Fish, birds, whales – they're all connected. *Delta Sound Connections*.

With a circulation of ~15,000, this annual newspaper published about the natural history of PWS and the Copper River Delta is distributed each May to airports and tourist areas in southcentral Alaska.

II. COORDINATION AND COLLABORATION

A. Within the Program

Table 1. Shared vessel platforms for this project with other EVOS projects.

EVOS Program/Project	Agency	Dates
PWS Herring & Research		
Validation of acoustic surveys for Pacific Herring using direct capture	PWS Science Center	Nov 2012-2016
Juvenile herring abundance index	PWS Science Center	Nov 2012-2016
Expanded adult Herring surveys	PWS Science Center	Late Mar/Apr 2013
Gulf Watch Alaska		
Long-term monitoring of humpback whale predation on Pacific herring in PWS	NOAA/UAS	Oct 2011 – Dec 2015
Monitoring long-term changes in forage fish distribution, abundance, and body condition in PWS	USGS	Sept. 2014

Seabird observations from this project is shared and integrated into the whale and herring surveys. In addition, information on herring, other fish and zooplankton prey fields around whale foraging areas, juvenile herring schools and adult herring schools is being used for the seabird analyses.

B. With Other Council-funded Projects

None

C. With Trustee or Management Agencies

Alaska Department of Fish and Game: Maria Wessel. ADFG provides a berth for a seabird observer during the October shrimp surveys.

Prince William Sound Science Center: Mary Anne Bishop. PWSSC provides a berth for a seabird observer during the February cruise to upload the Ocean Tracking Network arrays.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

1) Characterize the spatial and temporal distribution of seabirds in PWS during late fall and winter.
2) Relate seabird presence to prey fields identified during hydroacoustic surveys.
3) Identify critical biological and physical habitat characteristics for seabirds across PWS within and between winters.
4) Utilize increased temporal sampling resolution to improve our estimates of consumption of herring by seabirds during the winter.

B. Changes to Project Design

The only changes to the project design have had to do with shared vessels and timing of cruises. For October, since 2014 we have used the Alaska Department of Fish and Game annual shrimp survey as a platform for observations. This is a 10-d cruise that samples the exact same locations every year. Originally the Humpback Whale project was going to conduct a cruise in February that a seabird observer would accompany. This cruise is now in April. Similarly, we were going to place an observer on the Expanded Adult Herring Survey cruises, however the timing of these cruises (late March and late April) do not reflect winter bird abundance or habitat use as spring migration and in some cases breeding is already underway by then. As a result, since February 2014 we have placed the seabird observer on an annual February cruise that the PWS Science Center conducts to download acoustic arrays in Hinchinbrook Entrance and Montague Strait. Finally, in September 2014 our Gulf Watch seabird study collaborated with the Gulf WGulf Watch Alaskaatch *Humpback Whale* and *PWS Forage Fish*, and the Herring R& M *Acoustic Validation* in a pilot study to investigate fall movements of whales, fish, and birds into the Sound via Montague Strait.

IV. SCHEDULE

A. Project Milestones for FY 16 *(note: Milestones have been shifted to reflect the change in the project end date from September 30, 2016 to January 31, 2017)*

Objective 1. Characterize the spatial and temporal abundance of seabirds in PWS during late fall and winter.
To be met by January 2017.

Objective 2. Model species abundance and distribution in relation to biological and physical environmental factors
To be met by January 2017.

Objective 3. Assess seabird habitat associations within and between winters
To be met by January 2017.

Objective 4. Relate species composition and distribution to prey fields.
To be met by January 2017.

Objective 5. Identify critical marine habitats used by seabirds during late fall and winter
To be met by January 2017.

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (Feb 1 – Apr 30, 2016)

Feb	Field cruise: LTM seabird survey in conjunction with PWSSC Ocean Tracking Network cruise
Mar-Apr	Analyze data

FY 16, 2nd quarter (May 1-Jul 31, 2016)

May-Jul	Analyze data

FY 16, 3rd quarter (Aug 1- Oct 31, 2016)

Aug-Oct	Analyze data
Oct	Field cruise: LTM seabird survey in conjunction with ADFG shrimp survey for PWS

FY 16, 4th quarter (Nov 1, 2016 – January 31, 2017)

Nov	Field cruise: LTM seabird survey in conjunction with *Juvenile herring abundance index* and *Acoustic Validation*
Nov	Gulf Watch Alaska PI meeting
Nov-Dec	Analyze Data
Jan	Alaska Marine Symposium
Jan	Submit annual report

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Anne Schaefer arrived in August 2014 and is working as the avian biologist on this project. Jessica Stocking, who previously worked full time at the Science Center, is working on a limited basis with PI Bishop and consultant Dr. Ali Arab on the temporal and spatial modeling effort.

VI. BUDGET

A. Budget Forms

Provide completed budget forms.

B. Changes from Original Proposal

In 2014, we contracted with Quanticipate Consulting (Dr. Ali Arab) to assist us with modeling temporal and spatial trends of seabirds in winter. This contract should be completed by January 2016.

C. Sources of Additional Funding

This project relies on using ships of opportunity to conduct seabird observations. Projected in-kind ship time from non-EVOSTC funds includes $35.0 k ($3.5k/d @ 10 d/yr) from Alaska Department Fish and Game and $18.0k ($3.0k/d @ 6d/yr) from Ocean Tracking Network for the annual cruise to maintain the array (array maintenance is handled by the Prince William Sound Science Center).

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$46.0	$70.0	$72.0	$74.3	$77.3	$339.6	
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Contractual	$1.4	$2.1	$2.1	$2.1	$1.8	$9.5	
Commodities	$0.0	$0.0	$0.1	$0.1	$0.1	$0.3	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (will vary by proposer)	waived	waived	waived	waived	waived	waived	
SUBTOTAL	$47.4	$72.1	$74.2	$76.5	$79.2	$349.4	
General Administration (9% of subtotal)	$4.3	$6.5	$6.7	$6.9	$7.1	$31.5	
PROJECT TOTAL	$51.7	$78.6	$80.9	$83.4	$86.3	$380.9	
Other Resources (In kind Funds)	$10.5	$45.5	$63.5	$63.5	$63.5	$246.5	

$246.50

FY12-16

Project Title: 16120114-C Long-term monitoring of seabird abundance & habitat associations during late fall & winter in PWS
Project PI: M.A. Bishop

FORM 3A
NON-TRUSTEE
AGENCY SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
B. Hsu	Research Assistant	4.0	7.2		28.8
M.A. Bishop	Principal Investigator	3.9	12.4		48.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	19.6	0.0	
				Personnel Total	77.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
				Travel Total	0

FY16

Project Title:Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
network & software subscriptions $150/staff mo	1.2
communications (phone & fax) $50/staff mo	0.4
printing & copying $25/staff mo	0.2
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	1.8

Commodities Costs:	Commodities
Description	Sum
Supplies	0.1
Commodities Total	0.1

FY16

Project Title:Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0
		New Equipment Total	0

Existing Equipment Usage: Description	Number of Units	Inventory Agency
Desktop computer (2) and ruggedized computer (1)	3	PWSSC

FY16

Project Title:Long-term monitoring of seabird abundance & habitat associations during late fall & winter in Prince William Sd
Project PI: M.A. Bishop, PWS Science Center

FORM 3B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Project Title: Data Management Support for the EVOSTC Long Term Monitoring Program

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Rob Bochenek, Data Science

Study Location: EVOS Spill Affected Area

Project Website (if applicable): http://www.Gulf Watchalaska.org/

Abstract*: This project supplies the EVOS Long Term Monitoring (LTM) effort with critical data management support to assist study teams in efficiently meeting their objectives and ensuring data produced or consolidated through the effort is organized, documented and available to be used by a wide array of technical and non technical users. This effort leverages, coordinates and cost shares with several existing data management projects managed by the Alaska Ocean Observing System (AOOS) that are parallel in scope to the data management needs of the long term monitoring program. In the first two years, this project will focus on providing informatics support to streamline the transfer of information between various study teams and isolate and standardize historic data sets in the general spill affected area for use in retrospective analysis, synthesis and model development. These efforts continue into year three through five, but efforts will also begin to focus on developing management and outreach applications for the data and data products produced from the LTM program.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$164.0	$164.0	$164.0	$164.0	$163.0	$817.0

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$683.0	$640.0	$620.0	$500.0	$500.0	$2,943.0

***Funds expressed in $1000 increments*

Date: August 8, 2015

I. EXECUTIVE SUMMARY

As originally proposed, the objectives of this project are to 1) provide data management oversight and services for EVOS LTM project team data centric activities which include data structure optimization, metadata generation, and transfer of data between project teams; 2) consolidate, standardize and provide access to study area data sets that are critical for retrospective analysis, synthesis and model development; 3) develop tools for user groups to access, analyze and visualize information produced or processed by the LTM effort; and 4) integrate all data, metadata and information products produced from this effort into the AOOS data management system for long term storage and public use.

Project investigators continue to provide core data management oversight and services for the Long-term Monitoring Program known as Gulf Watch Alaska. The focus continues to be on establishing – and implementing - protocols for data transfer, metadata requirements and salvage of historic data, both those data funded by the *Exxon Valdez* Oil Spill Trustee Council and ancillary historic data from other projects. Investigators meet with National Center for Ecological Analysis and Synthesis investigator Matt Jones to coordinate future activities. PIs have participated in regular PI meetings, including the in-person meeting in November 2014 and the January 2015 data meeting and are coordinating activities between the Herring and LTM programs. In addition, the AOOS Ocean Research Workspace, rolled out to PIs in Year 1, continues to be used as the internal staging area for PI data and work products, with individual PI user and group profiles created. Several training seminars have been held via webinars, and PIs are now using the system to organize and consolidate their project level data. Software engineers at Axiom are providing support for the Workspace, resolving bugs and implementing new functionality in response to user feedback. All 2013 data are now posted on the Workspace, per the Program Management data sharing protocols, with 2014 data now being posted. The Gulf Watch Alaska Data Portal was released in September 2014 as a key component of the Alaska Ocean Observing System's Gulf of Alaska Ocean Data Explorer. The portal showcases Gulf Watch Alaska project data once it becomes public, alongside environmental data sets ingested by the project team.

Investigators have been involved in several exercises and meetings to optimize approaches to managing Gulf Watch data in more effective ways. Most notable of these activities occurred in January of 2014 during an EVOSTC sponsored Data Management Meeting. During that meeting, several recommendations were made which have spurred investigators to adapt their data management approach in support of the entire Gulf Watch program. Investigators have been modifying protocols defined in the Gulf Watch data management plan to address these issues.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

The Research Workspace technology being used for data management of the Gulf Watch Alaska program is designed to help facilitate the integration of datasets across disciplines and researchers within the Gulf Watch program. This technology is also being used by the EVOSTC sponsored herring program. Teams and investigators are able to access each other's datasets in a seamless fashion.

B. With Other EVOSTC-funded Projects

The Research Workspace is also being used to organize and centralize data and electronic resources for historic EVOS funded projects. NCEAS and AOOS data management teams have been working together over the span of the project to salvage and document as much information as possible for historic EVOS data that is in jeopardy of being lost to time.

C. With Trustee or Management Agencies

In September 2013 the data management team released the Alaska Ocean Observing System's Gulf of Alaska (GOA) Data Portal, which integrates data and project information produced by Gulf Watch Alaska researchers with a large number of additional GIS, numerical modeling and remote sensing data resources. The team was able to leverage the AOOS Ocean Data Explorer portal which has been developed using other funding (primarily NOAA) and has these additional features: an integrated search catalog which allows users to search by category or key word, ability to preview data before downloading files, and advanced visualization tools. The platform provides open access to a large array of valuable scientific information that can be accessed and used by mangers and scientists with Trustee Council agencies. AOOS data management has worked with several data consumers within USGS, NPS, BOEM and NOAA in accessing and using data contained within this data portal. The Research Workspace is also being used by the North Pacific Research Board's Gulf of Alaska Integrated Ecosystem Research Program. Historic data acquired through that program is also being provided to Gulf Watch Alaska PIs.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

1) Provide data management oversight and services for EVOS LTM project team data centric activities, which include data structure optimization, metadata generation, and transfer of data between project teams.

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

3) Develop tools for user groups to access, analyze and visualize information produced or processed by the LTM effort.

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

B. Changes to Project Design

Small changes have been made to protocols within the Gulf Watch Alaska Data Management Plan to address concerns of the EVOSTC Science Panel and include clarification of QA/QC procedures and review of Standard Operating Procedures (SOPs) by the program's internal science advisory team.

IV. SCHEDULE

A. Project Milestones for FY 16

For each project objective listed (III.A), specify when critical project tasks will be completed, as submitted in your original proposal. Please identify any substantive changes and the reason for the changes. Please format your information as in the following example:

Objective 1. Provide data management oversight and services for EVOS LTM project team data centric activities, which include data structure optimization, metadata generation, and transfer of data between project teams.
Assess and review year 5 data sets – To be met by September 2016

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

Data ingested in year 3 will be available via data access tools – To met by June 2016
Any additional historical data will be made available through the AOOS Gulf of Alaska portal - Ongoing

Objective 3. Develop tools for user groups to access, analyze and visualize information produced or processed by the LTM effort
New user tool platform (developed at 2015 PI meeting) released –
To be met by June 2016

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

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

February	*EVOS synthesis workshop with Herring and Long-term monitoring programs*
March	*Submit annual report*
March	*Submit annual financial report*

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

May	*Participate in Herring Program annual PI meeting*
July	*Submit Y5 work plan for review*
June	*Release version 2 of user tool platform*

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

September	*Oversee transfer of field year 4 data*
October	*Assess year 4 datasets and metadata submitted through Ocean Workspace*

FY 16, 4th quarter (November 1, 2016- January 31, 2016)

January	*Annual Marine Science Symposium*

V. PROJECT PERSONNEL – CHANGES AND UPDATES

None

VI. BUDGET

A. Budget Forms (Attached)

Attached

B. Changes from Original Proposal

No Change

C. Sources of Additional Funding

AOOS brings a significant level of leveraged resources, infrastructure, regional data management projects and partnerships to this proposed effort. The data management effort for the LTM and herring projects could not be accomplished for the budgeted amount by a team without these leveraged resources.

1. AOOS – (540k to AOOS DM) Alaska oceanographic data management effort. Supports open source, standards based data system that serves up and archives real-time sensor feeds, models & remote sensing data, GIS data layers, and historical datasets. Data system developed on interoperability concepts and meets NOAA Integrated Ocean Observing System standards and protocols for streaming data feeds to national data assimilation centers. Data Management Committee chaired by Dr. Phil Mundy provides ongoing advice, prioritization and direction to the team at Axiom Consulting & Design. AOOS board is made up of federal and state agencies, and major marine research institutions in the state that have committed to data sharing. The AOOS board has committed to supporting a statewide data system for as long as AOOS exists. Federal funding is stable, although we would like to see it increase. In the event AOOS was to end, all data and data products would be transferred to the University of Alaska.
2. NPRB GOAIERP – (80K) During this project year, NPRB will be providing funding to the AOOS data management team to support the Gulf of Alaska Integrated Ecosystem Research Program, which is performing research in the same area as Gulf Watch.
3. USFWS Seabird Data System – ($50K) Project involves the creation and population of a series of new seabird metric databases (diet and productivity) and integrating these new databases with legacy seabird databases (species distribution and abundance at seabird colonies, pelagic species distribution and abundance, USGS seabird monitoring databases and NPRB's North Pacific Seabird Diet Database). Modern spatially explicit, web based data entry interfaces have and continue to be developed to assist researchers existing in distributed agencies to contribute their historic and current seabird metric data into standard data structures. Project will result in vastly increasing the amount and quality of seabird species distribution, diet and other seabird data available for use in retrospective analysis and management. Though data includes areas around all of Alaska, most available data is located in GOA and PWS.
4. AOOS – collaborator with Alaska Data Integration Working Group – an initiative with the Alaska Climate Change Executive Roundtable – to develop protocols for serving up project data to increase data sharing among federal and state agencies.
5. AOOS and NOAA – initiatives to develop data sharing agreements with private sector, including oil & gas companies.
6. Kenai Fish Habitat Partnership/Cook Inlet Regional Citizens Advisory Council (30K) – contract with Axiom to develop a data management system for their oceanographic and contaminants data in Cook Inlet.
7. NOAA – Project to Axiom to develop a Cook Inlet beluga sightings database.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$138.5	$118.0	$122.300	$122.3	$121.3	$622.4	
Travel	$0.0	$0.0	$0.000	$0.0	$0.0	$0.0	
Contractual	$0.0	$0.0	$0.000	$0.0	$0.0	$0.0	
Commodities	$0.0	$0.0	$0.000	$0.0	$0.0	$0.0	
Equipment	$5.1	$4.8	$0.000	$0.0	$0.0	$9.9	
Indirect Costs (*will vary by proposer*)	$31.4	$27.1	$28.129	$28.1	$27.9	$142.7	
SUBTOTAL	$175.0	$149.9	$150.429	$150.4	$149.2	$774.9	
General Administration (9% of subtotal)	$15.8	$13.5	$13.5	$13.5	$13.4	$69.7	
PROJECT TOTAL	$190.8	$163.4	$164.0	$164.0	$162.6	$844.7	
Other Resources (in kind Funds)	$683.0	$640.0	$620.0	$500.0	$500.0	$2,943.0	

Leveraged Funding Sources
AOOS - Data management Activities (FY12 - 500K, FY13 - 500K, FY14 - 500K, FY15 - 500K, FY16 - 500k)
PWSSC -Project level data management system (FY12 - 48K)
Northern Forum/USFWS - North Pacific Seabird Data System (FY12 - 50K, FY13 - 50K, FY14 -50K)
ADF&G/AOOS - Data integration partnership/sharing (FY12 - 60K, FY13 - 90K, FY14 -70K)
CIRCAC - Regional Data Management Support for CI (FY12 - 25K)
Kenai Fish Habitat Partnership: FY15-28K
NPRB GOAIERP- FY15-80k
USFWS Seabird program: FY15- 50k

FY12-16

Program Title: 16120114-D Data Maanagement
Team Leader: Rob Bochenek, AOOS

SUMMARY

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
Shane StClair	Senior Software Engineer		1.5	9.6		14.4
Rob Bochenek	Infortmation Architect		0.5	10.4		5.2
Shared: Luc Mehl, Chris Turner and Jordar	Data Analyst		7.0	8.8		61.6
John Dunaway	Software Engineer/		2.0	8.8		17.6
Ross Martin	Software Engineer/		2.5	9.0		22.5
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	46.6	0.0	
					Personnel Total	$121.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY16

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs:	Commodities
Description	Sum
Commodities Total	$0.0

FY16

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: LTM Data Maanagement
Team Leader: Rob Bochenek, AOOS

FORM 3B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Project Title: Supplemental Data Management Support for EVOSTC Monitoring Programs

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Rob Bochenek, Axiom Consulting & Design

Study Location: EVOS Spill Affected Area

Project Website (if applicable): http://www.Gulf Watchalaska.org/

Abstract*: The EVOSTC Long Term Monitoring (LTM) and Prince William Sound Herring Research and Monitoring (PWS Herring) programs propose an ambitious monitoring and research agenda. These efforts could facilitate a more thorough understanding of the effects of the oil spill if the new data and information on the spill-affected ecosystems are effectively managed and collated along with historical data on these systems. Based on feedback acquired from the EVOSTC Science Panel and staff, we propose a supplemental data management effort to execute on major tasks that have been deemed of high importance but are not being addressed by existing data management projects supporting EVOSTC programs (Projects 1412011D and 1412011C). This project proposes to increase the data management support for both LTM and PWS Herring programs by establishing a data coordinator position to improve metadata quality and best practices. Furthermore, this project will develop mechanisms to transfer and integrate LTM and PWS Herring program data products into DataONE.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$0	$0	$0	$121.8	$126.0	247.8

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL

**Funds expressed in $1000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

Three data management-related projects have been previously funded by EVOSTC. The first project, led by the Alaska Ocean Observing System (AOOS), was titled "Data Management Support for the EVOSTC Long Term Monitoring Program" (Project #14120114D). The second project, also led by the Alaska Ocean Observing System (AOOS), was titled "Data Management Support for the EVOSTC Prince William Sound Herring Research and Monitoring Program" (Project #1412011C). Together, they provided data management support for EVOSTC's Long Term Monitoring (LTM) and Prince William Sound Herring Research and Monitoring (PWS Herring) programs and had the following objectives: (1) provide data management oversight and services using the AOOS Ocean Workspace as a tool for sharing data within these research programs prior to publication, (2) consolidate, standardize, and provide access to study area datasets, (3) develop tools to help user groups access, analyze and visualize information produced by the LTM effort, and (4) integrate LTM and PWS Herring data, metadata and information products into the AOOS data management system for long term storage and public distribution and use.

A third project was led by the National Center for Ecological Analysis and Synthesis (NCEAS) titled "Collaborative Data Management and Holistic Synthesis of Impacts and Recovery Status Associated with the Exxon Valdez Oil Spill" (Project #114120120). That project's funded objectives included the following: (1) provide data management oversight and services, (2) consolidate, standardize and provide access to study area data sets, focusing on retrospective analyses, synthesis and model development, (3) develop user tools to access, analyze and visualize LTM and PWS Herring data, (4) organize, analyze and model historical datasets, (5) integrate data into the AOOS data management system, (6) augment AOOS/IOOS preservation and interoperability system with other data systems through integration of DataONE services, and (7) conduct additional broad synthesis activities on spill impacts and recovery as part of whole-ecosystem analysis through NCEAS working groups.

After the NCEAS-led project was initiated, it became clear that integrating DataONE services into the AOOS/IOOS interoperability services (Project #114120120, Objective 6) would require significant time and effort on the part of AOOS, which was serving as an unfunded partner. The funding-to-work disparity was noted in the EVOSTC Long Term Programs Data Management Meeting on January 29-30, 2014 (EVOS Data Meeting Summary, Pg 2). Notes from that meeting describe EVOSTC staff encouraging AOOS to become a DataONE Member node, a process that can be facilitated by NCEAS but requires technical development from AOOS staff. Becoming a DataONE member node will provide EVOSTC with replication beyond the redundancy provided by Axiom's data centers in Portland and Providence. As a member node, a copy of all of the LTM and PWS Herring data in the AOOS data system will be distributed across other nodes in the DataONE network.

In addition to EVOSTC data distribution and archiving needs, both ongoing data management projects observed the need for a dedicated data coordinator position. In the initial proposal, program researchers were thought of as being enabled to organize their own files, author their own metadata, and meet data input and processing milestones with minor supervision and oversight. However, the depth and breadth

of the EVOSTC programs along with the myriad of data formats, conventions and personalities required full-time attention, and the LTM program hired a full-time program coordinator (Dr. Tammy Neher). The leadership of that program coordinator in the program greatly improved the quality, organization and metadata throughout the program. However, notes from EVOS Data Meeting Summary suggest that more metadata detail is still needed. They give suggestions on specific issues (e.g., weather or instrument abnormalities, deviations from published standard operating procedures, etc.), and they note a position similar to the LTM program coordinator position should be identified for the PWS Herring program. (EVOS Data Meeting Summary, Pg 3). Furthermore, the current program coordinator will shift their focus away from data coordination tasks in FY15 and FY16 to more aggressively support the Gulf Watch synthesis effort. For these reasons, it is critical for the success of both EVOSTC programs that resources be dedicated to support data coordination.

Previous proposals for the EVOS LTM and PWS Herring program proposals outlined the relevance of the proposed monitoring, data management and syntheses efforts to the EVOSTC 1994 Restoration Plan goals. Management and dissemination of the monitoring data collected through these programs is critical in order to allowing outside researchers and the public to evaluate, share, and build upon measured outcomes of restoration for all of the scientific priorities described in the restoration plan.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

The Research Workspace technology being used for data management of the Gulf Watch Alaska program is designed to help facilitate the integration of datasets across disciplines and researchers within the Gulf Watch program. This technology is also being used by the EVOSTC sponsored herring program. Teams and investigators are able to access each other's datasets in a seamless fashion.

B. With Other EVOSTC-funded Projects

The Research Workspace is also being used to organize and centralize data and electronic resources for historic EVOS funded projects. NCEAS and AOOS data management teams have been working together over the span of the project to salvage and document as much information as possible for historic EVOS data that is in jeopardy of being lost to time.

C. With Trustee or Management Agencies

In September 2013 the data management team released the Alaska Ocean Observing System's Gulf of Alaska (GOA) Data Portal, which integrates data and project information produced by Gulf Watch Alaska researchers with a large number of additional GIS, numerical modeling and remote sensing data resources. The team was able to leverage the AOOS Ocean Data Explorer portal which has been developed using other funding (primarily NOAA) and has these additional features: an integrated search catalog which allows users to search by category or key word, ability to preview data before downloading files, and advanced visualization tools. The platform provides open access to a large array of valuable scientific information that can be accessed and used by mangers and scientists with Trustee Council agencies. AOOS data management has worked with several data consumers within USGS, NPS, BOEM and NOAA in accessing and using data contained within this data portal. The Research Workspace is also being used by the North Pacific Research Board's Gulf of Alaska Integrated Ecosystem Research Program. Historic data acquired through that program is also being provided to Gulf Watch Alaska PIs.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

1) Provide additional, needed data management support for LTM and PWS Herring programs.
2) Implement technical mechanisms to transfer LTM and PWS Herring program data from the AOOS data system to DataONE.

B. Changes to Project Design

Small changes have been made to protocols within the Gulf Watch Alaska Data Management Plan to address concerns of the EVOSTC Science Panel and include clarification of QA/QC procedures and review of Standard Operating Procedures (SOPs) by the program's internal science advisory team.

IV. SCHEDULE

A. Project Milestones for FY 16

For each project objective listed (III.A), specify when critical project tasks will be completed, as submitted in your original proposal. Please identify any substantive changes and the reason for the changes. Please format your information as in the following example:

Objective 1. Provide additional, needed data management support for LTM and PWS Herring programs through a dedicated data coordinator position
Redevelop Herring Program Research Workspace – To be met by March 2016

Objective 2. Implement technical mechanisms to seamlessly transfer LTM and PWS Herring program data from the AOOS data system to systems maintained by Trustee Council agencies and national archives.
Data One enablement – To be met by June 2016

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 30, 2016)

March	Submission of 2015 field data to OBIS-USA complete

FY 16, 2nd quarter (May 1, 2016 - July 30, 2016)

May	Participate in annual PI meeting

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

August	Initiate processing of 2016 field season data into preservation formats
September	Testing of production level DataONE member node

FY 16, 4th quarter (November 1, 2016 - January 31, 2017)

January	Gulf Watch data portal fully operation as DataONE member Node
January	Attend Alaska Marine Science Symposium

V. PROJECT PERSONNEL – CHANGES AND UPDATES

None

VI. BUDGET

A. Budget Forms

Provided separately

B. Changes from Original Proposal
No Change

C. Sources of Additional Funding
AOOS brings a significant level of leveraged resources, infrastructure, regional data management projects and partnerships to this proposed effort. The data management effort for the LTM and herring projects could not be accomplished for the budgeted amount by a team without these leveraged resources.

1. AOOS – (540k to AOOS DM) Alaska oceanographic data management effort. Supports open source, standards based data system that serves up and archives real-time sensor feeds, models & remote sensing data, GIS data layers, and historical datasets. Data system developed on interoperability concepts and meets NOAA Integrated Ocean Observing System standards and protocols for streaming data feeds to national data assimilation centers. Data Management Committee chaired by Dr. Phil Mundy provides ongoing advice, prioritization and direction to the team at Axiom Consulting & Design. AOOS board is made up of federal and state agencies, and major marine research institutions in the state that have committed to data sharing. The AOOS board has committed to supporting a statewide data system for as long as AOOS exists. Federal funding is stable, although we would like to see it increase. In the event AOOS was to end, all data and data products would be transferred to the University of Alaska.
2. NPRB GOAIERP – (80K) During this project year, NPRB will be providing funding to the AOOS data management team to support the Gulf of Alaska Integrated Ecosystem Research Program, which is performing research in the same area as Gulf Watch.
3. USFWS Seabird Data System – ($50K) Project involves the creation and population of a series of new seabird metric databases (diet and productivity) and integrating these new databases with legacy seabird databases (species distribution and abundance at seabird colonies, pelagic species distribution and abundance, USGS seabird monitoring databases and NPRB's North Pacific Seabird Diet Database). Modern spatially explicit, web based data entry interfaces have and continue to be developed to assist researchers existing in distributed agencies to contribute their historic and current seabird metric data into standard data structures. Project will result in vastly increasing the amount and quality of seabird species distribution, diet and other seabird data available for use in retrospective analysis and management. Though data includes areas around all of Alaska, most available data is located in GOA and PWS.
4. AOOS – collaborator with Alaska Data Integration Working Group – an initiative with the Alaska Climate Change Executive Roundtable – to develop protocols for serving up project data to increase data sharing among federal and state agencies.
5. AOOS and NOAA – initiatives to develop data sharing agreements with private sector, including oil & gas companies.
6. Kenai Fish Habitat Partnership/Cook Inlet Regional Citizens Advisory Council (28K) – contract with Axiom to develop a data management system for their oceanographic and contaminants data in Cook Inlet.
7. NOAA – Project to Axiom to develop a Cook Inlet beluga sightings database.

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$0.0	$0.0	$0.0	$90.9	$94.0	$184.9	
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Contractual	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$20.9	$21.6	$42.5	
SUBTOTAL	$0.0	$0.0	$0.0	$111.7	$115.6	$227.4	
General Administration (9% of subtotal)	$0.0	$0.0	$0.0	$10.1	$10.4	$20.5	
PROJECT TOTAL	$0.0	$0.0	$0.0	$121.8	$126.0	$247.8	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	

COMMENTS:
This summary page provides an five-year overview of proposed funding and actual cumulative spending. The column titled 'Actual Cumulative' should be updated each fiscal year to provide information on the total amount actually spent for all completed years of the project. On the Project Annual Report Form, if any line item exceeds a 10% deviation from the originally-proposed amount; provide detail regarding the reason for the deviation. Please provide descriptions for Other Resources funding for your projects in this comments section.

FY12-16

Program Title: 16150114-T Supplemental Data Management Support for EVOSTC Monitoring Programs
Team Leader: Rob Bochenek, AOOS

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
Rob Bochenek	Information Architect		0.5	10.4		5.2
Vacant	Data Coordinator		6.0	8.4		50.4
Ross Martin	Software Engineer		4.0	9.6		38.4
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	28.4	0.0	
					Personnel Total	$94.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY16

Program Title: Supplemental Data Management Support for EVOSTC Monitoring Programs
Team Leader: Rob Bochenek, AOOS

FORM 3B
PERSONNEL & TRAVEL DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

Contractual Costs: Description		Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$0.0

Commodities Costs: Description	Commodities Sum
Commodities Total	$0.0

FY16

Program Title: Supplemental Data Management Support for EVOSTC Monitoring Programs
Team Leader: Rob Bochenek, AOOS

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 12-FY16

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY16

Program Title: Supplemental Data Management Support for EVOSTC Monitoring Programs
Team Leader: Rob Bochenek, AOOS

FORM 3B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Long term monitoring of oceanographic conditions in Prince William Sound

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Campbell, Robert W., Prince William Sound Science Center, 300 Breakwater Ave., Box 705, Cordova, AK

Study Location: Prince William Sound, Hinchinbrook Entrance, Montague Strait, Simpson Bay, Whale Bay, Eaglek Bay, Zaikof Bay

Project Website: www.gulfwatchalaska.org/monitoring/environmental-drivers/oceanographic-conditions-in-prince-william-sound/

Abstract*: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al. This project is intended to provide physical and biological measurements that may be used to assess bottom-up impacts on the marine ecosystems of Prince William Sound. Specifically, it is proposed to deploy an autonomous profiling mooring in central Prince William Sound that will provide high frequency (~daily) depth-specific measurements of physical (temperature, salinity, turbidity), biogeochemical (nitrate, phosphate and silicate) and biological (Chlorophyll-a concentration) parameters, over the course of the growing season (focused on the vernal and autumn blooms). Several regular vessel surveys are also proposed to provide ground-truth data for the mooring, and to attempt to capture some of the spatial variability in PWS. As well as the mooring site, the surveys will visit all four of the SEA bays to maintain ongoing EVOSTC funded time series measurements at those sites and to support proposed herring research (Pegau et. al). The major entrances (Hinchinbrook Entrance and Montague Strait) will also be visited. The surveys will make the same suite of measurements as the mooring, and will also collect water and plankton samples. This project will also link significantly with the herring research efforts proposed by Pegau et al.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$238.1	$193.2	$197.3	$203.7	$209.3	$1,041.6

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$23.3	$23.3	$23.3	$145.0	$135.0	$349.9

** Figures given in $1,000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

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

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

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

1. All plankton samples collected by the lower Cook Inlet group (Angela Doroff) are analyzed as part of this project.
2. Following extended discussions as to sampling protocols for zooplankton among the different projects (PIs Batten, Doroff and Hopcroft), we have begun a simple intercomparison study to examine how the different gears used are sampling and how they might be compared.
3. Working specifically with Sonia Batten, plankton categories have been defined so that the more detailed taxonomic categories determined as part of this project may be "downscaled" so to be comparable with the Continuous Plankton Recorder surveys conducted by Batten.
4. A dialog has begun among all of the PIs of the "Environmental Drivers" section on data availability to better understand variability in the spring bloom throughout the northern Gulf of Alaska.

B. With Other EVOSTC-funded Projects

This project has provided plankton data to researchers within the PWS Herring Survey (PI Ron Heintz), and regularly sends live and preserved plankton to the Hershberger group at Marrowstone Research Station for genetic and histological work looking for vectors of fish pathogens. Campbell has collaborated with PIs Batten and Pegau on a publication looking at long term changes in ecosystem and herring productivity.

C. With Trustee or Management Agencies

1. A researcher from NOAA (Johanna Vollenweider) working on a project independent of the council-funded effort has participated in a cruise, to collect herring scales and tissue samples for development of better age determination methods.
2. Seawater samples have been collected for the Ocean Acidification research group at NOAA AFSC/UAF Ocean Acidification Research Center (contact: Natalie Monacci).
3. ADF&G was assisted with a check on reported herring spawn in Port Gravina (contact: Steve Moffitt).
4. Seawater samples were taken to send to the WHOI radioisotope group, which will be tested for the presence of isotopes characteristic of the 2011 Fukushima Daiichi nuclear disaster (contact: Ken Buesseler).

5. Project staff have been an on-call response vessel for emergency retrieval of a number of gliders (surface and subsurface) deployed in PWS by NOAA AFSC staff (contact: Wiley Evans).
6. Campbell regularly coordinates with local ADF&G staff on observations of herring spawn locations, and collected a significant proportion of the age/sex/length samples of adult herring in PWS in 2015 (contact: Steve Moffitt).

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

Objective 1. Install and maintain an autonomous profiling mooring in PWS.

Objective 2. Conduct regular surveys in PWS.

Objective 3. Support continued herring research by maintaining the existing time series (hydrography, plankton and nutrients) at the four SEA bays.

B. Changes to Project Design

1. Profiling mooring: The original intention of this project was to leave the profiling mooring in place operationally for most of the year. After 1.5 years of operation, we have learned that significant maintenance and calibration work is required, and that winter conditions are energetic enough that it is unwise to leave such an expensive piece of equipment in place all winter long. Given that much of the profiler's instrumentation is biophysical, we have focused on the productivity season in PWS, deploying the profiler in late winter (prior to the spring bloom), and retrieving it in late autumn (following the autumn bloom period). The profiler is bleeding-edge technology, and this project is by far the most northerly and deepest deployment of the system to date, and it has suffered a number of malfunctions, necessitating unplanned (and unbudgeted) trips to retrieve/redeploy the mooring. Communications have also been something of an issue (the local cellular provider's data service could charitably be referred to as "flakey"), but all data is logged internally and analyzed post-hoc.

Most of bugs in the system have been worked out, and the 2015 deployment of the profiler has been extremely successful: it was deployed on March 21st, and has done daily profiles since then, missing only a single day between the initial deployment and the time of this report (the profiler was instructed to skip a day due to an anticipated storm event). The entire spring bloom was observed, as well as several wind-driven productivity events. A proposal to upgrade the profiler was funded by the North Pacific Research Board in 2015, which will upgrade the electronics and communications hardware (improving the reliability of communications), and add an *in situ* plankton camera.

2. Nutrient measurements: It was originally planned to measure macronutrients (nitrate, phosphate, silicic acid) via Capillary Electrophoresis (CE), and considerable time and effort (under this project and other non-EVOSTC projects) has been expended working up various methods, with limited success: CE is a separation technique (similar to HPLC, but using electric current instead of pressure), and the non-nutrient cations present in seawater interfere considerably with the analysis. There is a considerable backlog of samples in storage (frozen), and in 2014 we went back to the standard wet-chemical methods for the analysis of nutrients to work on that backlog. In 2015, a proposal to purchase a Seal Analytical AutoAnalyzer 3 was funded by the Rasmuson Foundation. The instrument will allow automated analysis of nitrate, which is the most labor-intensive macronutrient to measure. The instrument was ordered in July 2015, and it should be installed and operational by October; a technician has been identified to do the work, and will be working through the backlog this autumn.

IV. SCHEDULE

A. Project Milestones for FY 16

For each project objective listed (III.A), specify when critical project tasks will be completed, as submitted in your original proposal. Please identify any substantive changes and the reason for the changes. Please format your information as in the following example:

Objective 1. Install and maintain an autonomous profiling mooring in PWS.
To continue into autumn 2015 (~early November) and resume in March 2016

Objective 2. Conduct regular surveys in PWS.
Surveys will be conducted in September/October and November 2014, and six cruises will be conducted in 2016.

Objective 3. Support continued herring research by maintaining the existing time series (hydrography, plankton and nutrients) at the four SEA bays
Surveys in the bays will be conducted in September/October and November 2015, and six cruises will be conducted in 2016.

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)
March: *PWS Survey, Mooring deployed*

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)
May: *PWS Survey, Mooring maintenance*
June: *PWS Survey, Mooring maintenance*

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)
August: *PWS Survey, Mooring maintenance*
October: *PWS Survey, Mooring maintenance*

FY 16, 4th quarter (November 1, 2016- January 31, 2017)
November: *PWS Survey, Mooring maintenance*
PI meeting

V. PROJECT PERSONNEL – CHANGES AND UPDATES

No personnel have been added or removed from the project

VI. BUDGET

A. Budget Forms (Attached)

Budget form attached.

B. Changes from Original Proposal

No changes requested

C. Sources of Additional Funding

PWSSC provides a CTD profiler (SBE model 25plus) with several auxiliary sensors (chlorophyll fluorometer, backscatter turbidometer, oxygen sensor, solid state active fluorometer and nitrate

analyser), which is used for all field surveys, and to cross-calibrate with the profiler (value ~$75K). Extracted chlorophyll-*a* is read on a Turner Designs TD-700 fluorometer (replacement cost ~$10K). As well as the moored profiler, PWSSC provides a pair of acoustic releases, and a 1-m diameter syntactic foam float with upward and downward looking RDI ADCP current profilers (value ~$50K). The Alaska Ocean Observing System has also contributed $10K in FY15 for surveys in PWS. The North Pacific Research Board will contribute approximately $100K in upgrades to the profiling mooring in FY16, and support several additional service visits (~$20K). The Rasmuson foundation contributed $15K towards purchasing the Seal Analytical Autoanalyzer 3.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$12.4	$121.6	$125.4	$131.2	$136.3	$526.8	
Travel	$0.0	$1.0	$1.0	$1.0	$1.0	$4.0	
Contractual	$1.0	$43.7	$43.7	$43.7	$43.7	$175.8	
Commodities	$0.0	$11.0	$11.0	$11.0	$11.0	$44.0	
Equipment	$205.0	$0.0	$0.0	$0.0	$0.0	$205.0	
Indirect Costs (will vary by proposer)	waived	waived	waived	waived	waived	waived	
SUBTOTAL	$218.4	$177.3	$181.1	$186.9	$192.0	$955.6	
General Administration (9% of subtotal)	$19.7	$16.0	$16.3	$16.8	$17.3	$86.0	
PROJECT TOTAL	$238.1	$193.2	$197.3	$203.7	$209.3	$1,041.6	
Other Resources (Cost Share Funds)	$23.3	$23.3	$23.3	$145.0	$135.0	$349.9	

COMMENTS: The Science Center waives Indirect Costs for this project due to its administration of the overall proposal. PWSSC provides a CTD profiler (SBE model 25plus) with several auxiliary sensors (chlorophyll fluorometer, backscatter turbidometer, oxygen sensor, solid state active fluorometer and nitrate analyser), which is used for all field surveys, and to cross-calibrate with the profiler (value ~$75K). Extracted chlorophyll-a is read on a Turner Designs TD-700 fluorometer (replacement cost ~$10K). As well as the moored profiler, PWSSC provides a pair of acoustic releases, and a 1-m diameter syntactic foam float with upward and downward looking RDI ADCP current profilers (value ~$50K). The Alaska Ocean Observing System has also contributed $10K in FY14 for surveys in PWS.

FY12-16

Program Title: 16120114-E PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Robert Campbell	Principle Investigator	5.0	9.9		49.5
Robert Campbell - at sea rate	Principle Investigator	0.5	10.4		5.2
Technician: Caitlin McKinstry	Field/lab technician	12.0	6.8		81.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	27.1	0.0	
				Personnel Total	$136.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Alaska Marine Science Symposium	0.4	1	3	0.2	1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY16

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
Instrument calibration	3.0
Vessel Charter	37.8
Network and telephone	2.6
Printing	0.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$43.7

Commodities Costs:	Commodities
Description	Sum
Reagents and lab supplies	5.0
Mooring supplies	5.0
Sampling Hardware	1.0
Commodities Total	$11.0

FY16

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency
Seabird Conductivity Temperature Depth (CTD) meter	1	PWSSC
WETlabs fluorometer	1	PWSSC
Satlantic SUNA	1	PWSSC
Mooring releases	2	PWSSC
Mooring flotation	4	PWSSC

FY16

Program Title: PWS Oceanographic monitoring
Team Leader: Robert Campbell

FORM 3B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

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

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Angela Doroff (University of Alaska Anchorage, Kachemak Bay National Estuarine Research Reserve) and Kris Holderied (NOAA Kasitsna Bay Laboratory)

Study Location: Kachemak Bay, lower Cook Inlet

Project Website: http://www.gulfwatchalaska.org/

Abstract*: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services. This project is designed to assist in the evaluation of recovery and restoration of injured resources in the foot print of the *Exxon Valdez* oil spill (EVOS). It is important to know if oceanic conditions and changes in the Gulf of Alaska are synchronous with near-shore trends, and monitoring at multiple sites will help discern such relationships. Mapping currents and water mass movements of a region contributes to our understanding of patterns in the abundance and diversity of marine plankton, invertebrates, fish, birds, and mammals in coastal Alaska. We are mapping the waters in lower Cook Inlet and Kachemak Bay to understand the intrusions of the Alaska Coastal Current and to identify spatial and temporal changes in this region and relate these observations to injured resources. Developing an understanding of the structure of the physical oceanography will help us understand the connectivity of water movement and potential plankton transport between lower Cook Inlet and Kachemak Bay. By determining the local species of phytoplankton and zooplankton and understanding their seasonal distribution we will begin to understand the biological patterns associated with upper trophic levels of the nearshore marine system. Information from this project will also be useful to local mariculture operations, subsistence harvesters of hard shell clams and other invertebrates, NOAA Regional Ocean Circulation Model applications, and monitoring programs for harmful algal blooms.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$191.9	$177.4	$166.5	$133.7	$108.8	$778.2

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$282.0	$180.0	$180.0	$255.0	$255.0	$1,152.0

** Funds expressed in $1000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

This project is designed to assist in the evaluation of recovery and restoration of injured resources in the foot print of the *Exxon Valdez* oil spill (EVOS), by characterizing oceanic conditions in Cook Inlet and determining, in coordination with oceanographic monitoring at other sites under the Gulf Watch Alaska program, connections between marine conditions and plankton communities in near-shore and Gulf of Alaska waters. It is important to know if oceanic conditions and changes in the Gulf of Alaska are synchronous with near-shore trends, and monitoring at multiple sites (in coordination with other Gulf Watch Alaska monitoring projects) will help discern such relationships. We are particularly interested in how near-shore conditions reflect the significant inter-annual variability in the North Pacific Ocean which is driven partially by variations in major climate patterns such as ENSO and the Pacific Decadal Oscillation. In addition we are investigating linkages between marine conditions in Cook Inlet/Kachemak Bay and Prince William Sound. Both are large estuaries that are connected by the Alaska Coastal Current, influenced by freshwater input (precipitation and snowpack and glacier melt), and experience upwelling of waters from the adjacent shelf. Cook Inlet has stronger tidal currents and associated complex oceanographic fronts that are linked to bathymetry and freshwater runoff. In this study, we also leverage use of data from past oceanographic monitoring in Cook Inlet (Okkenon et al. 2009) and Kachemak Bay (Murphy and Iken 2013) to extend the time series used for analysis. Mapping currents and water mass movements of a region is essential for understanding patterns in the abundance and diversity of marine plankton, invertebrates, fish, birds, and mammals in coastal Alaska. By characterizing phytoplankton and zooplankton communities and understanding their seasonal distribution, we will quantify seasonal patterns lower trophic species that support upper trophic level marine organisms. In coordination with the Seward Line (PI: Hopcroft) and Continuous Plankton Recorder (PI: Batten) projects we are assessing estuary-shelf linkages and potential plankton transport pathways between Kachemak Bay, lower Cook Inlet and the adjacent Gulf of Alaska shelf.

The project combines intensive oceanographic monitoring in Kachemak Bay, with seasonal, quarterly monitoring in lower Cook Inlet. Kachemak Bay monitoring includes: 1) continuous data from existing Kachemak Bay Research Reserve (KBRR) water quality monitoring stations (YSI sondes measuring temperature, salinity, dissolved oxygen, turbidity, pH) at the Homer and Seldovia harbors; 2) an additional shoreline water quality station that is deployed and maintained during ice-free months in Bear Cove (near head of Kachemak Bay); and 3) monthly small-boat conductivity-temperature-depth (CTD) profiler and plankton sampling conducted on a mid-bay transect (from Homer Spit). The seasonal surveys include CTD and plankton sampling along the five transects shown in Figure 1. Note that the Continuous Plankton Recorder (PI: Batten) vessel track intersects three of our Cook Inlet transects.

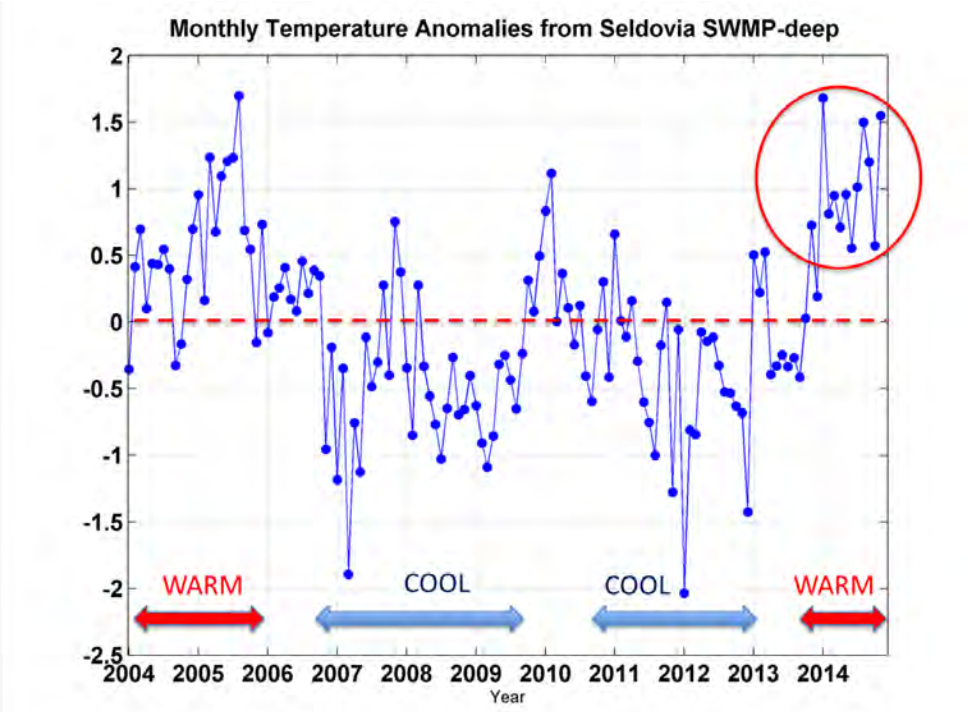
Figure 1: Cook Inlet seasonal sampling transects and water quality monitoring stations

Information from this project is also being used to inform local mariculture operations, understand local depletions of hard shell clam and other invertebrate species, develop NOAA Cook Inlet ocean circulation model applications, and support monitoring and research programs for harmful algal blooms and ocean acidification.

In the first four project years, we have observed both anomalously cold and anomalous water temperature conditions, with a transition from colder to warmer conditions observed in late fall 2013. Warmer water temperatures, approximately 1-2 degrees Celsius above 2004-2014 monthly average temperatures,

persisted through 2014 and to present in 2015, consistent with anomalously warm northeast Pacific Ocean temperatures. Figure 2 shows a time series of water temperature anomalies at the Seldovia water quality monitoring station, indicating periods of warm and cool temperatures. In the past 12 months Cook Inlet monitoring results were presented in an article in the program science synthesis report, in a talk at the Alaska Marine Science Symposium (January 2015) and in a talk at the Pacific Anomalies Workshop at Scripps (May 2015).

Figure 2. 2004-2014 monthly water temperature anomalies (degrees C) calculated from observations at the near-bottom sonde and the KBRR SWMP station at Seldovia harbor. Anomalies are relative to average monthly temperatures calculated from 2004-2014 record. 2014 temperatures are noted with red circle, with every month warmer than average.



II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

The lower Cook Inlet oceanographic and plankton monitoring project was designed to complement concurrent monitoring conducted in other projects of the Environmental Drivers component of the EVOSTC-funded Gulf Watch Alaska program. These projects include "The Seward Line: marine ecosystem monitoring in the northern Gulf of Alaska" (PI: Hopcroft), "Long-term Monitoring of Oceanographic Conditions in the Alaska Coastal Current from Hydrographic Station GAK 1" (PI:Weingartner), "Long-term monitoring of oceanographic conditions in Prince William Sound" (PI:Campbell), and "Long-term Monitoring of zooplankton populations on the Alaskan Shelf and Gulf of Alaska using Continuous Plankton Recorders" (PI: Batten). Collectively, the Gulf Watch Alaska oceanographic sampling provides comparisons between conditions within two large estuaries, Cook Inlet (PIs: Doroff and Holderied) and Prince William Sound (PI: Campbell) and between the estuaries and the adjacent shelf (PIs: Weingartner, Hopcroft and Batten). Campbell is also providing identification for the Cook Inlet zooplankton samples, which enhances data consistency across the integrated program. The Environmental Drivers component group has also met in person and by phone to improve coordination of zooplankton sampling methods, to enhance cross-program data analysis and assess the need for future modifications in sampling design.

To support other Gulf Watch Alaska biological monitoring efforts, this project is providing oceanographic time series for the Kachemak Bay benthic component project "Long-term monitoring of Ecological Communities in Kachemak Bay: a comparison and control for Prince William Sound" (PIs: Konar and Iken) and berths on our lower Cook Inlet cruises for U.S. Fish and Wildlife Service seabird and marine mammal observers who are part of the pelagic monitoring component (PI: Kuletz).

In the past 12 months we worked with other PIs in the Environmental Drivers component (Batten, Campbell, Hopcroft, Weingartner) to write and revise the introduction for the Environmental Drivers section of the science synthesis report (Chapter 2) and Holderied co-authored (with Weingartner) an article entitled "Linking Variability in Oceanographic Patterns Between Nearshore and Shelf Waters Across the Gulf of Alaska".

B. With Other EVOSTC-funded Projects

This study does not leverage other EVOSTC funded projects outside of Gulf Watch Alaska, although oceanographic data sampling and analysis is being coordinated with the EVOSTC-funded Herring Research and Monitoring Program (PI: Pegau).

C. With Trustee or Management Agencies

KBRR provides resources for continuous monitoring of water quality and meteorological data and this proposed project leverages and supplements the System-wide Monitoring Program (SWMP) of NOAA's National Estuarine Research Reserve system at KBRR and use of a CTD and plankton nets. NOAA KBL is providing in-kind contributions of staff time and use of a CTD. The combined in-kind contributions from KBRR and KBL are expected to be $155K for project year 5, with additional funds leveraged from other organizations (see below). Thus far, this research and monitoring program have provided the following linkages to related projects in the study area:

a. KBRR and KBL are using oceanographic data from this project to help validate a Cook Inlet ocean circulation model developed by NOAA's National Ocean Service, which has been used for a tidal energy assessment of the Inlet and will be part of a NOAA operational Cook Inlet marine forecast system. KBRR and the University of Alaska Fairbanks (UAF) are using time series of oceanographic data (temperature and salinity) from long-term monitoring studies (inclusive of but not limited to this project) and drifter buoy data in an external model validation effort. KBL is providing CTD data to the model developer (NOS Coast Survey Development Laboratory) for development and validation efforts. The model is projected to be operational by 2017 and development will have benefited from the data generated in this EVOSTC project.
b. This study is improving the time series and geographic scope of ongoing monitoring of phytoplankton for harmful algal species conducted by KBRR and KBL, in support of NOAA mission goals to detect and improve response to harmful algal blooms. The phytoplankton species that causes paralytic shellfish poisoning, *Alexandrium fundyense,* has been found at times at all Kachemak Bay sampling locations throughout the summer, although at relatively low concentrations to date. *A. fundyense* concentrations were found to be significantly correlated with both water temperature and salinity conditions and these relationships are being used to develop a new web-based PSP risk assessment tool. In project year 4, Kachemak Bay experienced bloom conditions for *Pseudo-nitzschia*, the phytoplankton species can produce domoic acid toxins (see project highlights), although toxin levels have been low to date.
c. NOAA KBL has a joint project with the Alaska Ocean Observing System (AOOS) and UAF to quantify variability in water chemistry associated with ocean acidification in Kachemak Bay and lower Cook Inlet. The project leverages ship time from this project to periodically collect water samples at CTD stations for carbonate chemistry analysis. Coastal water chemistry changes with freshwater input from glacial watersheds and snowmelt, upwelling of ocean waters and

phytoplankton blooms and understanding this variability is needed to assess how much ocean acidification may threaten nearshore species and habitats. FY15 funding ($25K) was provided to KBL by NOAA's Integrated Ocean Observing System (IOOS) and $25K is also in the AOOS FY16 plan (subject to availability of funding).

d. We continue to collaborate with the U.S. Fish and Wildlife Service to provide ship berths for USFWS observers to conduct marine bird and mammal surveys that will improve understanding of relationships between marine conditions, primary productivity, and seabirds and marine mammals. For project years 4 and 5, USFWS received funding from the Bureau of Ocean Energy Management (BOEM) to support the seabird and marine mammal observing effort.

e. NOAA KBL and BOEM also initiated a two-year collaboration in 2014 to update information on marine conditions and ecological linkages in Cook Inlet, to support BOEM's environmental analysis for potential oil and gas lease sales in the region. BOEM has provided $150K to conduct seasonal Cook Inlet surveys and oceanographic data analysis to support their environmental analysis needs for potential oil and gas lease sales in the region. The BOEM funding is allowing us to maintain quarterly Cook Inlet cruises, for which there was not sufficient funding available under our original EVOSTC proposal.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

There are no significant changes from the original proposal to this project, except that we are leveraging additional funding to maintain quarterly seasonal oceanographic surveys in lower Cook Inlet. The objectives for project year 5 include:

1. Improve understanding of marine conditions and water mass movement in Kachemak Bay
    a. Conduct monthly CTD sampling surveys along a mid-Kachemak Bay transect and continuous sampling at KBRR water quality stations at Seldovia and Homer harbors.
    b. Install a seasonal YSI data sonde in Bear Cove during the ice-free period to monitor trends in salinity, temperature, and nutrients at the head of the Bay in proximity to oyster farms and native clam beds.
    c. Analyze water mass characteristics and spatial, seasonal and annual changes in the strength, depth and persistence of stratified conditions in Kachemak Bay/Cook Inlet.
2. Continue to assess linkages between Kachemak Bay/lower Cook Inlet and waters of the adjacent Gulf of Alaska shelf and Alaska Coastal Current
    a. Leveraging funding from BOEM, conduct four seasonal oceanographic surveys in lower Cook Inlet (see Figure 1 for sampling locations).
    b. Analyze CTD data for spatial, seasonal and annual variability and trends, as well as linkages to oceanographic conditions measured by other Gulf Watch Alaska investigators in Prince William Sound, at the GAK1 mooring and along Seward Line.
3. Examine the short-term variability and track long-term trends in oceanographic and water quality parameters from water quality station observations. Assess persistence of warm water conditions associated with the Pacific Ocean warm anomaly and linkages to conditions in Prince William Sound and the northern Gulf of Alaska shelf.
4. Improve understanding of temporal and spatial variability in plankton communities and linkages to marine conditions.
    a. Sample zooplankton and phytoplankton at a subset of stations along each oceanographic transect (see Figure 1 for locations). Zooplankton samples will continue to be analyzed by Rob Campbell as part of the Prince William Sound oceanographic monitoring project. Phytoplankton will continue to be analyzed by KBL staff.

b. Continue comparison of temporal and spatial patterns in zooplankton distributions between lower Cook Inlet observations and continuous plankton recorder observations (Batten project).
c. Use results of summer 2015 nutrient field sampling project (separate NOAA funded KBL project) to guide 2016 nutrient sampling at a subset of plankton monitoring stations in lower Cook Inlet and Kachemak Bay.

B. Changes to Project Design

No changes to original project personnel or proposed year 5 project budget. We are leveraging funding from other sources (BOEM and NOAA) to complete four seasonal surveys in year 5 and to conduct sampling and analysis for nutrients to better understand temporal variability in marine nutrient supply and the effect on primary production in Cook Inlet and Kachemak Bay. This will also parallel similar efforts in Prince William Sound (Campbell project).

IV. SCHEDULE

A. Project Milestones for FY 16 (project year 5)

1. Objective 1-3.

a. Quarterly CTD/marine plankton surveys will be conducted in lower Cook Inlet (see Figure 1), leveraging BOEM funding.

b. Monthly CTD/marine plankton surveys will be conducted in Kachemak Bay.

c. Continuous water quality station monitoring data will be collected at 5 KBRR stations during ice-free months and 3 stations during winter months. Kachemak Bay sub-bay temperatures will be monitored year-round with Hobo tidbit sensors deployed by KBRR.

d. Quality-controlled and processed CTD data will provided to the Gulf Watch Alaska Ocean Workspace no later than one year after data collection. Water quality station monitoring data is available through the NERR Centralized Data Management Office (http://cdmo.baruch.sc.edu/)

2. Objective 3.

a. Using data collected in Objective 1, we will calculate temperature and salinity patterns and anomalies (for continuous data) in lower Cook Inlet and Kachemak Bay.

3. Objective 4. For samples collected during our field cruises, phytoplankton samples will be analyzed by KBL and zooplankton samples preserved and shipped to the Prince William Sound Science Center for analysis. The species composition, timing, and where applicable, relative abundance of marine plankton will be determined for the study area. When complete, these trends will also be related to other Gulf Watch Alaska studies, including the Prince William Sound (Campbell) and Gulf of Alaska shelf oceanographic projects (Hopcroft, Weingartner, Batten), the Kachemak Bay nearshore monitoring project (Konar and Iken) and the pelagic seabird monitoring project (Kuletz).

B. Measurable Project Tasks for FY 16

All year: *Monthly CTD/plankton survey in Kachemak Bay*
Continuous water temperature monitoring in Kachemak Bay sub-bays

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

February: *Project funding available*
1st Quarterly CTD/plankton survey in lower Cook Inlet

	Continuous water quality monitoring at 3 SWMP stations (2 at Seldovia, 1 at Homer)
March:	*Continuous water quality monitoring at 3 SWMP stations*
April:	*2nd Quarterly CTD/plankton survey in Cook Inlet*
	Continuous water quality monitoring at 5 SWMP stations (2 at Seldovia, 2 at Homer, 1 at Bear Cove)

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

May :	*Continuous water quality monitoring at 5 SWMP stations*
June :	*Continuous water quality monitoring at 5 SWMP stations*
July:	*3rd Quarterly CTD/plankton survey in lower Cook Inlet*
	Continuous water quality monitoring at 5 SWMP stations

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

August:	*Continuous water quality monitoring at 5 SWMP stations*
	September: Continuous water quality monitoring at 5 SWMP stations
October:	*4rd Quarterly CTD/plankton survey in lower Cook Inlet*
	Continuous water quality monitoring 5 SWMP stations
	Draft 5-year report/special issue input to science coordinator

FY 16, 4th quarter (November 1, 2016- January 31, 2017)

November:	*Continuous water quality monitoring 3 SWMP stations*
	Attend annual PI meeting
December:	*Continuous water quality monitoring 3 SWMP stations*
January:	*Annual and 5-year report input to science coordinator*
	Present at Alaska Marine Science Symposium
	Continuous water quality monitoring 3 SWMP stations

V. PROJECT PERSONNEL – CHANGES AND UPDATES

There are no changes to the project personnel. On 1 July 2015, the Kachemak Bay Research Reserve transitioned from the Alaska Department of Fish and Game to the University of Alaska Anchorage (UAA) and Doroff is now a UAA employee.

VI. BUDGET

A. Budget Forms (Attached)

There is no change from our original proposal for the amount of funding requested for project year 5, though there are minor (<10%) changes in allocation of funds between budget categories. Please see budget workbook provided for the Kachemak Bay Research Reserve and the NOAA Kasitsna Bay Laboratory. The transition of KBRR from ADFG to UAA may affect the KBRR overhead amount for the project (still to be determined in the transition process), but it will not increase the total funding for KBRR or the project.

B. Changes from Original Proposal

The only changes from the original proposal are that 1) we are leveraging KBRR project cost savings and a KBL collaboration with BOEM to maintain a quarterly frequency of Cook Inlet sampling without additional EVOSTC funding and 2) we will conduct nutrient sampling at no additional cost. Pending a decision on the amount of UAA project overhead, we may add additional vessel charter time to the project.

C. Sources of Additional Funding

During year one of this study, we supported work being conducted for this EVOTC grant with an additional $102K of funding for new water quality monitoring equipment which enabled the purchase of equipment for continuous monitoring of Chlorophyll a at each of the water quality monitoring sites in Kachemak Bay; these data will be available to this project through year five. Additional in-kind contributions to this project for year 5 total $180K from the following sources: $120K for KBRR's System-wide Monitoring Program for water quality and weather observations; $10K CTD (2 CTDs are utilized on the project, one each from KBRR and the NOAA KBL; and $25K in salaries for KBL staff. Funding from other sources that will support the project include: $75K from BOEM for collaboration with KBL, and $25K from the NOAA Integrated Ocean Observing System program/AOOS for collaboration with KBL. For project years 1-5, the combined in kind contributions from KBRR and KBL and additional funding from other sources will total $1,152K.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$66.0	$69.3	$72.8	$64.2	$63.2	$335.5	
Travel	$7.8	$7.8	$7.8	$12.7	$7.6	$43.9	
Contractual	$52.3	$54.3	$54.3	$28.3	$14.5	$203.7	
Commodities	$21.1	$23.6	$17.8	$17.4	$14.5	$94.4	
Equipment	$28.8	$7.7	$0.0	$0.0	$0.0	$36.5	
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
SUBTOTAL	$176.0	$162.7	$152.7	$122.7	$99.8	$714.0	
General Administration (9% of subtotal)	$15.8	$14.6	$13.7	$11.0	$9.0	$64.3	
PROJECT TOTAL	$191.9	$177.4	$166.5	$133.7	$108.8	$778.2	
Other Resources (Cost Share Funds)	$282.0	$180.0	$180.0	$255.0	$255.0	$1,152.0	

COMMENTS:
Due to the transition of KBRR from ADFG to UAA, there may be changes to the proposed budget for Kachemak Bay Research Reserve. However, this transition occurred just prior to the proposal submission and details are not clear at this time regarding non-trustee overhead. There are no changes in the proposed budget for NOAA Kasitsna Bay Lab in year 5. Minor (<10%) change requested in allocation between categories.
Kachemak Bay Research Reserve: Yr 5 In-kind contribution of $125K for water quality/weather monitoring and CTD use. We propose to use savings from prior years to help conduct seasonal Cook Inlet surveys (not funded by EVOSTC in year 5).
NOAA Kasitsna Bay Lab: Yr 5 in kind contribution of $5K for CTD equipment and $25.0K in salary for KBL staff. Additional leveraged funds obtained by KBL for Yr 5 of project: $150K from BOEM ($75 in FY14, $75K in FY15) for Cook Inlet monitoring which will, with KBRR savings from prior project years, let us continue to conduct quarterly seasonal surveys. $25K from AOOS for additional Kachemak Bay oceanographic sampling. Budget category changes: Reduce travel by $200 and use for increased cost of CTD calibration.

FY12-16

Project Title: 16120114-G Kbay/Cook Inlet Oceanography
Team Leaders: Angela Doroff, Kris Holderied

SUMMARY

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$66.0	$69.3	$72.8	$64.2	$63.2	$335.5	
Travel	$3.7	$3.7	$3.7	$6.1	$3.7	$20.9	
Contractual	$49.8	$51.8	$51.8	$25.8	$11.8	$191.0	
Commodities	$8.1	$16.6	$10.8	$8.4	$8.5	$52.4	
Equipment	$23.8	$0.0	$0.0	$0.0	$0.0	$23.8	
SUBTOTAL	$151.4	$141.4	$139.0	$104.6	$87.2	$623.5	
General Administration (9% of subtotal)	$13.6	$12.7	$12.5	$9.4	$7.8	$56.1	
PROJECT TOTAL	$165.0	$154.1	$151.6	$114.0	$95.0	$679.6	
Other Resources (In kind Funds)	$227.0	$125.0	$125.0	$125.0	$125.0	$727.0	

COMMENTS: We do not anticipate any major changes to the project in the proposed 5th year. Project overhead may change as part of transition from ADFG to UAA, but these details are not clear at this time. Over years 1-4 we project that we will have saved approximately $32.8K due to leveraging of additional funding, and we propose utilizing these funds for two additional seasonal surveys in year 5. Combined with BOEM funding obtained by Holderied, this will allow us to maintain quarterly survey frequency in project year 5. In this study, KBRR leveraged our LTM grant to obtain $102K for new water quality monitoring equipment to have Chl_a probes at each of the water quality monitoring sites in Kachmak Bay in Yr1 of the study. In kind annual contributions: $120K KBRR SWMP, $5K CTD (1 CTD are utilized on the project) for an annual KBRR in kind contribution of $125K.

FY12-16

Project Title: 16120114-G Kbay/Cook Inlet Oceanography
Team Leader: Angela Doroff

FORM 4A
TRUSTEE AGENCY SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Doroff, Angela		3.0	9.7	0.0	29.2
Fishery Biologist		4.0	8.5		34.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	18.2	0.0	
				Personnel Total	$63.2

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium - F&G	0.3	2	5	0.4	2.6
Water/Air taxi within Kachemak Bay - F&G	0.1	6			0.5
Principal Investigator Meeting - Anchorage	0.2	1	2	0.2	0.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.7

FY16

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
Calibration and repair	2.5
Shipping - samples	1.3
Boat charter	8.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$11.8

Commodities Costs:	Commodities
Description	Sum
Boat fuel and repair	6.5
Probes	2.0
Commodities Total	$8.5

FY16

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY16

Program Title: Long-Term Monitoring
Team Leader: Angela Doroff
Agency: Fish & Game/SF/KBRR

FORM 4B
EQUIPMENT DETAIL

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Travel	$4.2	$4.2	$4.2	$6.6	$4.0	$23.1	
Contractual	$2.5	$2.5	$2.5	$2.5	$2.7	$12.7	
Commodities	$13.0	$7.0	$7.0	$9.0	$6.0	$42.0	
Equipment	$5.0	$7.7	$0.0	$0.0	$0.0	$12.7	
SUBTOTAL	$24.7	$21.4	$13.7	$18.1	$12.7	$90.5	
General Administration (9% of subtotal)	$2.2	$1.9	$1.2	$1.6	$1.1	$8.1	
PROJECT TOTAL	$26.9	$23.3	$14.9	$19.7	$13.8	$98.6	
Other Resources (In kind Funds)	$55.0	$55.0	$55.0	$130.0	$130.0	$425.0	

COMMENTS:
No revisions to total amount of funds requested for NOAA Kasitsna Bay Lab in year 5 compared to original proposal. Minor change requested in allocation of funds between spending categories (<10%)
NOAA Kasitsna Bay Lab: Yr 5 in kind contribution of $5K for CTD equipment and $25.0K in salary for KBL staff. Additional leveraged funds obtained by KBL for Yr 5 of project: $150K from BOEM ($75 in FY14, $75K in FY15) for Cook Inlet monitoring which, with KBRR savings from project years 1-4, will let us continue quarterly frequency of seasonal surveys (EVOSTC project funding not sufficient for quarterly surveys in years 4 and 5). $25K from AOOS for additional Kachemak Bay oceanographic sampling. Budget category changes: Reduce travel by $200 and use for increased cost of CTD calibration. Prior year funding: Yr 4 funds for attendance at national science conference will be used to present results at Ocean Sciences conference in Feb 2016.

FY12-16

Project Title: 15120114-G Kachemak Bay/Cook Inlet Oceanography
Team Leader: Kris Holderied
Agency: NOAA Kasitsna Bay Laboratory

FORM 4A
TRUSTEE AGENCY SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
				0.0	0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Syposium - NOAA	0.3	1	5	0.3	1.8
Water/Air taxi within Kachemak Bay - NOAA	0.1	12			1.0
Principal Investigator Meeting - Anchorage	0.3	1	3	0.3	1.2
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$4.0

FY16

Project Title: 15120114-G Kachemak Bay/Cook Inlet Oceanography
Team Leader: Kris Holderied
Agency: NOAA Kasitsna Bay Laboratory

FORM 4B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
Calibration and repair	2.7
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$2.7

Commodities Costs:	Commodities
Description	Sum
Supplies	1.0
KBL boat fuel	5.0
Commodities Total	$6.0

FY16

Project Title: 15120114-G Kachemak Bay/Cook Inlet Oceanography
Team Leader: Kris Holderied
Agency: NOAA Kasitsna Bay Laboratory

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency
CTD profiler - Seabird 19+ with dissolved oxygen, turbidity/fluorescence, and PAR sensors	1	1

FY16

Program Title: Long-Term Monitoring
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

FY15 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Science Coordination and Synthesis for the Long Term Monitoring Program (Gulf Watch Alaska)

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Kris Holderied and Tammy Hoem Neher, NOAA Kasistna Bay Laboratory Kris.Holderied@noaa.gov, 907-399-4412, 2181 Kachemak Drive, Homer, AK 99603

Study Location: North-central Gulf of Alaska region from Katmai National Park to Prince William Sound

Project Website: www.gulfwatchalaska.org

Abstract*: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et al (2011). This project explicitly provides for science coordination and syntheses of data from our long-term monitoring program (Gulf Watch Alaska), as well as incorporating an interdisciplinary framework into program development and implementation. The science coordination and synthesis component of our integrated program improves linkages between monitoring in different regions (Prince William Sound, Gulf of Alaska shelf, lower Cook Inlet) as well as between disciplines in a given region, as a way to better discern the impacts of environmental change on restoration and continued recovery of injured resources. Science coordination includes facilitating program planning and sharing of information between principal investigators, developing annual reports on the science program, and coordinating ongoing evaluation of the overall program. Science synthesis efforts help integrate information across the entire program and are closely coordinated with the conceptual ecological modeling and data management teams in our integrated program.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$123.5	$139.0	$148.35	$146.06	$151.62	$708.50

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$13.0	$13.0	$13.0	$13.0	$13.0	$65.0

** Funds expressed in $1000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

The overarching goal of the long-term monitoring program (Gulf Watch Alaska) is to provide sound scientific data and products to inform management agencies and the public of changes in the environment and the impacts of these changes on injured resources and services. The science coordination and synthesis efforts support this goal by documenting the overall scientific information from the monitoring program, improving information sharing between program principal investigators (PIs) and with the Herring Research and Monitoring program (HRM), assisting in development of multi-disciplinary datasets and tools, and informing an ongoing evaluation of the long term monitoring program's effectiveness and priorities in meeting EVOSTC goals. This continuing project addresses three primary objectives: 1) improve communication and data sharing; 2) improve and document integration of monitoring results; and 3) improve communication of monitoring information to trustee agency and other resource managers and the general public.

II. COORDINATION AND COLLABORATION

A. Within an EVOSTC-Funded Program

The first objective of the science synthesis project is to improve communication and data sharing between the various projects within the Gulf Watch Alaska program. Below is a list of the projects and coordination activities we propose for year 5 of the program:

Gulf Watch Alaska Program Management, Outreach, and Administration Activities

- *Program coordination and logistics – Prince William Sound Science Center (PWSSC) and Alaska Ocean Observing System (AOOS):* The science lead and science coordinator will continue to work closely with PWSSC staff to assist with overall administrative activities of the program, including developing reports, and planning meetings and events.
- *Outreach – AOOS:* The science coordinator will continue to participate in the Outreach Planning Committee and work to report and plan local events (Homer, Alaska) as well as assist with annual updates to website pages and publicly accessible information.
- *Data management –AOOS/Axiom Consulting:* The science coordinator and science lead will continue to work closely with Axiom staff to develop new data management and data access tools, including participating in AOOS tool rating webinars and teleconferences, providing data and feedback for new access tools in the data portal, and providing feedback to improve metadata generation tools. The science coordinator also will continue to work with all project PIs within the program to ensure new data is loaded to the portal, has undergone QA/QC measures, and also has appropriate metadata available for public access.
- *Historical data management and synthesis – National Center for Ecological Assessment and Synthesis (NCEAS):* The science coordinator will continue to facilitate communication between project PIs and NCEAS staff for data collection and synthesis and work to provide feedback for new data management tools and data publication. The science coordinator will also facilitate communication between the NCEAS-led synthesis working groups, and the Gulf Watch Alaska and Herring Research and Monitoring program PIs.
- *Conceptual ecological modeling– Alaska Sea Life Center (ASLC):* The science coordinator will continue to work with ASLC staff to develop sub-model descriptions and updates and

incorporate information into reports as well as plan and coordinate model development during meetings and workshops for the program.

Gulf Watch Alaska Field Monitoring Project Coordination Activities

The science coordinator will continue to conduct a variety of activities to facilitate reporting, outreach, sharing, and publication of the information from the various monitoring projects. These activities will include:

1. Tracking and assisting with data and metadata publication in the program data portal.
2. Editorial review, collation, and writing the program synthesis pieces of reports and work plans.
3. Editorial review, website development and updates, and assistance with coordination of outreach events for each project.
4. Planning and documenting all quarterly teleconferences and meetings, providing notes and information to the group.
5. Attendance and presentation of program information at a variety of scientific workshops to facilitate coordination of ideas and information from outside of the program.
6. Maintenance and updates for program intranet site for purposes of conveying important dates and program information to the group.

These activities will continue to be conducted as a coordinated effort for all of the following monitoring projects within the program:

- *Gulf of Alaska mooring (GAK1) monitoring – University of Alaska Fairbanks (UAF)*
- *Seward line monitoring – UAF*
- *Oceanographic conditions in Prince William Sound – PWSSC*
- *Oceanographic monitoring in Cook Inlet – Kachemak Bay Research Reserve (KBRR)/ University of Alaska Anchorage (UAA) and NOAA Kasitsna Bay Laboratory (KBL)*
- *Continuous plankton recorder –Sir Alister Hardy Foundation for Ocean Science (SAHFOS)*
- *Ability to detect trends in nearshore marine birds – US National Park Service Southwest Alaska inventory and monitoring Network (SWAN)*
- *Long-term killer whale monitoring – North Gulf Oceanic Society (NGOS)*
- *Humpback whale predation on herring – NOAA National Marine Fisheries Service (NMFS) Auke Bay Laboratory*
- *Forage fish distribution and abundance – U. S. Geological Survey (USGS) Alaska Science Center*
- *Prince William Sound marine bird surveys – U.S. Fish and Wildlife Service (USFWS)*
- *Nearshore benthic systems in the Gulf of Alaska – USGS Alaska Science Center/ USNPS SWAN, Coastal Resources Associates*
- *Ecological Communities in Kachemak Bay – UAF*
- *EVOS oil exposure of harlequin ducks and sea otters – USGS Alaska Science Center*

Lingering oil level and weathering tracking – NOAA/NMFS Auke Bay Laboratory

B. With Other EVOSTC-funded Projects

As part of the Science Coordination and Synthesis project, the science lead and science coordinator will continue to work closely with the Herring Research and Monitoring program team lead and PIs to maintain reporting consistencies and share information. The science coordinator and HRM program lead will continue to participate in annual meetings, teleconferences and work closely to encourage information sharing and address shared questions between the programs.

C. With Trustee or Management Agencies

As described above, the long-term monitoring program science coordinator and science lead coordinate ecosystem monitoring activities with NOAA, USFWS, USGS and USNPS investigators in the Gulf Watch Alaska program. We also coordinate with Alaska Department of Fish and Game researchers and managers through coordination on synthesis activities with the HRM program and in coordination with NCEAS working groups.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

This project addresses three primary objectives that are ongoing: 1) improve communication and data sharing; 2) improve and document integration of monitoring results; and 3) improve communication of monitoring information to resource managers and the general public.

B. Changes to Project Design

No changes are proposed.

IV. SCHEDULE

A. Objectives for FY16

Objective 1. Improve communication, data sharing and coordinate field work planning between principal investigators of the individual monitoring projects, as well as with other agencies and research organizations.
Ongoing throughout project.

Objective 2. Improve and document integration of science monitoring results across the Gulf Watch Alaska program - working with the PIs, data management and modeling teams as well as other agencies and research organizations.
Ongoing throughout project.

Objective 3. Improve communication of monitoring information to resource managers and the public through data synthesis and visualization products and tools – working with the data management, conceptual ecological modeling and outreach teams, as well as other agencies and research organizations
Ongoing throughout project.

B. Measurable Project Tasks for FY 16

Many of the Science Coordination and Synthesis tasks and activities will be ongoing throughout year 5 and will continue as proposed. These include:

1. Coordinate with program team leads, PIs, administrative team and EVOSTC staff on overall Gulf Watch Alaska program planning, reporting and evaluation. This includes coordinating and planning a joint special issue with the Herring Research and Monitoring program to be used as the programs' five year status summary.

2. Plan agendas and facilitate program and small working group meetings and teleconferences.

3. Maintain program field work schedule and tracking of outreach and research activities.

4. Coordinate with the herring program lead on program implementation and joint information needs.

5. Coordinate with groups outside the Gulf Watch Alaska program (North Pacific Research Board Gulf of Alaska project, USFWS Landscape Conservation Cooperatives, etc.) on joint synthesis of information.

6. Coordinate with PIs to improve integration of multi-disciplinary monitoring activities within geographic regions (PWS, outer Kenai Peninsula coast, lower Cook Inlet) and of monitoring within single disciplines between different regions.

7. Assist in development and refinement of conceptual ecological models with the modeling team, herring program lead, and outside groups.

8. Work with data management team, modeling PI, and outreach team to develop data exploration and visualization tools.

9. Assist with internal "beta" testing of initial data visualizations and tools developed by the data management team.

10. Network with other monitoring programs and regional stakeholders to identify information needs that may be met by improved data visualization tools for the Gulf Watch Alaska program data.

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

February: *Compile/edit Year 4 annual report for EVOSTC and semi-annual NOAA report.*
March: *Submit Year 4 annual report for EVOSTC and semi-annual NOAA report.*
April: *Plan and coordinate quarterly program teleconference*
Submit next 5 year program proposal
Continue planning for year 5 status summary report or special journal issue, in coordination with HRM lead and EVOSTC staff

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

May: *Complete updates to program website and outreach materials*
June-July: *Coordinate review and response to comments from proposal.*
Plan and facilitate quarterly program teleconference

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)
August: *Compile and edit semi-annual report for NOAA*
September 1: *Submit revised program proposal for FY 2017 invitation (pending EVOSTC invitation to propose)*
October: *Plan annual PI meeting and workshops*
Coordinate compilation of initial draft of five year status summary or special journal issue manuscripts

FY 16, 4th quarter (November 1, 2016- January 31, 2017)
November: *Annual PI meeting and workshops*
December-January: *Preparation for and attendance at AMSS*
Plan and facilitate quarterly program teleconference
Coordinate preparation and submission date of 5-year status summary or joint special issue with HRM program and EVOSTC staff

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Dr. Tammy Hoem Neher, the long-term monitoring program science coordinator, is included as a PI on the Science Coordination and Synthesis project.

VI. BUDGET

A. Budget Forms (Attached)

Please see LTM program budget workbook.

B. Changes from Original Proposal

No changes.

C. Sources of Additional Funding

NOAA Kasitsna Bay Laboratory will provide in-kind salary support ($13K) for the science lead (Holderied) in year 5 of this project.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$90.0	$111.6	$115.2	$117.6	$121.2	$555.6	
Travel	$10.8	$9.4	$11.4	$9.9	$11.4	$52.9	
Contractual	$7.5	$5.5	$5.5	$5.5	$5.0	$29.0	
Commodities	$1.0	$1.0	$1.0	$1.0	$1.5	$5.5	
Equipment	$4.0	$0.0	$3.0	$0.0	$0.0	$7.0	
Indirect Costs (*will vary by proposer*)							
SUBTOTAL	$113.3	$127.5	$136.1	$134.0	$139.1	$650.0	
General Administration (9% of subtotal)	$10.2	$11.5	$12.2	$12.1	$12.5	$58.5	
PROJECT TOTAL	$123.5	$139.0	$148.3	$146.1	$151.6	$708.5	
Other Resources (in kind Funds)	$13.0	$13.0	$13.0	$13.0	$13.0	$65.0	

No changes to total budget amount proposed in year 5 from original proposal. Minor (<10%) change in budget categories, with $500 moved from contractual to supplies. Homer office space rental costs will increase in year 5, but the cost increase will be covered by eliminating costs for software maintenance.
In-Kind contributions: NOAA Kasitsna Bay Laboratory salary for Holderied ($65K total for FY12-16, $13K for project year 5).

FY12-16

Program Title: 16120114-H Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4A
TRUSTEE AGENCY
SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Physical scientist/ Ecologist	Synthesis coordinator	12.0	10.1	0.0	121.2
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	10.1	0.0	
				Personnel Total	$121.2

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Marine Science Symposium (2 people for 5 days)	0.4	2	10	0.2	2.7
Coordination mtgs w/EVOSTC and LTM team (2 people/ 2 days @3/yr)	0.4	6	12	0.2	4.5
Principal Investigator Meeting - Anchorage (2 people for 3 days)	0.4	2	6	0.2	1.9
Coordination mtg with Herring Program - Cordova (2 people for 3 days)	0.6	2	6	0.2	2.3
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$11.4

FY16

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
PERSONNEL &
TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
Office space rental - Homer	5.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$5.0

Commodities Costs:	Commodities
Description	Sum
Supplies	1.5
Commodities Total	$1.5

FY16

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY16

Program Title: LTM - Coordination & Synthesis
Team Leader: Kris Holderied
Agency: NOAA

FORM 4B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Long-term Monitoring: Synthesis and Conceptual Modeling - Conceptual Ecological Modeling

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s):
Tuula Hollmen (Principal Investigator), Alaska SeaLife Center and University of Alaska Fairbanks, PO Box 1329, Seward, AK 99664; Phone: 907-224-6323; Fax 907-224-6320; Email: tuulah@alaskasealife.org
Suresh Sethi (Collaborator), Alaska Pacific University, 4101 University Drive, Anchorage, AK 99508; Email: sasethi@gmail.com

Study Location: N/A

Project Website www.gulfwatchalaska.org

Abstract*: This project is a component of the integrated Gulf Watch Alaska Long-term Monitoring of Marine Conditions and Injured Resources and Services program. We will develop conceptual ecological models to support the synthesis and planning relating to the long term monitoring program in Prince William Sound, outer Kenai coast, and lower Cook Inlet/Kachemak Bay. We will summarize system components, processes, and influences into a synthetic framework and develop submodels to support programmatic integration across its components. Conceptual models will assist in identification of data needs and development of long term monitoring priorities. Through refinement of models, they will also demonstrate progress in understanding of ecosystem structure and function through the Gulf Watch Alaska program. The conceptual models will provide a framework for development of numerical and quantitative models of system function and responses to external influences. Finally, the conceptual models will provide a communication tool among scientists, resource managers, policy-makers, and the general public, and will provide visualization tools to support outreach efforts of the Gulf Watch Alaska program.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA*):

FY12	FY13	FY14	FY15	FY16	TOTAL
$83.1	$91.9	$95.6	$78.6	$81.9	$431.0

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

** Funds expressed in $1000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

Conceptual ecological models are considered a key element of environmental and biological monitoring programs. Models provide a schematic framework to organize and illustrate complex system structure, thus serving as a tool to facilitate understanding and communication among scientists, managers, and the public. Gulf Watch Alaska is a long term, integrated monitoring program focused on environmental drivers and pelagic and benthic components of the Gulf of Alaska marine ecosystem. While extensive long term monitoring data from different components of the system exists, much of that information needs to be synthesized and assessed to understand the range of factors affecting individual species and the ecosystem as a whole. Interdisciplinary syntheses of historical and ongoing monitoring data are needed to answer remaining questions about the recovery of injured resources, and plan priorities for continued monitoring of status and dynamics of the Gulf ecosystem.

The conceptual ecological modeling project will provide a framework for 1. exploration, understanding, and synthesis of key components and processes of our study system, 2. refinement and development of further monitoring strategies, and 3. development of outreach and communication tools among scientists, managers, general public, and other interested parties. The conceptual models are developed to support the synthesis of data and to serve as a framework and guide for development of monitoring priorities, to meet the overall goals of the long term monitoring program.

Products to date include a general conceptual Gulf of Alaska ecosystem model and a semi-quantitative rating tool to elicit expert input on properties of system linkages into conceptual ecological models. The linkage rating methods are applied to a suite of sub-models to explore ecosystem components and control mechanisms in the Gulf of Alaska in greater detail. We have developed the framework and are compiling data for a nearshore system model, which will be used to examine the impact of changes in invertebrate prey fields on consumers of interest as measured by a suite of behavioral and demographic performance metrics. A total of four sub-models are planned as described by Hollmen and Sethi in the science synthesis report (2014):
Sub-model 1: Key trophic linkages in nearshore northern Gulf ecosystem
Sub-model 2: Ecological linchpin with forage fish abundance
Sub-model 3: Top-down control with humpback whale predation
Sub-model 4: Bottom-up control with environmental forcing on plankton populations

Publications during 2015 include a manuscript describing conceptual modeling methods was accepted for publication in 2015 and a chapter in programmatic synthesis report:

Sethi S. and T. Hollmen. Conceptual models for marine and freshwater systems in Alaska: flexible tools for research planning, prioritization, and communication. Arctic, *in press*.

Hollmen, T. and S. Sethi. 2014. Conceptual Models. pgs. 6.1-6.6 *in* Hoem Neher et al. editors. Quantifying temporal and spatial ecosystem variability across the northern Gulf of Alaska. Science Synthesis report for the Gulf Watch Alaska Program, numbers 14120114 and 14120120. Exxon Valdez Oil Spill Trustee Council. Anchorage, Alaska.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

The components and projects funded under the Gulf Watch program are closely linked to the conceptual modeling project. The conceptual modeling is driven by expert input from program PIs. The input is

gathered in modeling workshops, working group meetings, meetings with individual PIs, phone and conference calls, and by email surveys.

B. With Other EVOSTC-funded Projects

The modeling efforts will be coordinated with the EVOS TC funded herring research program.

C. With Trustee or Management Agencies

Input on objectives from management agencies and experts on sub-modeling themes will be incorporated into modeling efforts. The input will be gathered through stakeholder webinars, workshops, and meetings.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

The objectives of the conceptual modeling project are:

1. *Develop conceptual ecological models, summarizing key components, processes, and functions of the study system*

2. *Develop computer applications and web-based interfaces for interactive data exploration and visualization*

B. Changes to Project Design

No changes to project design.

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. Develop a conceptual ecological model of the study system.
To be met by January 2017

Objective 2. Develop computer applications and web-based interfaces for interactive data exploration and visualization.
To be met by January 2017

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

April:	*Draft Sub-model 1 (Nearshore model)*
April	*Framing and data analysis for Sub-model 2 (Linchpin model)*

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

July:	*Draft Sub-model 2 (Linchpin model)*
July	*Framing and data analysis for Sub-models 3-4 (Top-down, Bottom-up model)*

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

October:	*Draft Sub-model 3-4 (Top-down, Bottom-up model)*

FY 16, 4th quarter (November 1, 2016- January 31, 2017)

November:	*Review sub-models with program PIs*

January:	*Draft sub-model manuscript*
January:	*Attend AMSS and present conceptual modeling results*
January:	*Conceptual modes based visualization tools for outreach*

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Lisa Sztukowski started as a research associate in July 2015. Working together with PI Hollmen, collaborator Sethi, program PIs, and other experts, she will develop the sub-models identified in our work plan. She will coordinate and elicit input for models, conduct data analysis, develop visualization tools, and prepare manuscripts. Dr. Sztukowski's curriculum vitae is provided separately with this submission.

VI. BUDGET

A. Budget Forms (Attached)

Budget forms are provided separately

B. Changes from Original Proposal

No changes requested.

C. Sources of Additional Funding

No additional sources of funding at this time.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$10.0	$14.4	$19.200	$20.1	$21.0	$84.7	
Travel	$5.7	$5.7	$5.700	$5.7	$5.7	$28.5	
Contractual	$38.4	$40.2	$42.000	$29.2	$30.6	$180.4	
Commodities	$4.0	$4.0	$0.000	$0.0	$0.0	$8.0	
Equipment	$0.0	$0.0	$0.000	$0.0	$0.0	$0.0	
Indirect Costs (*will vary by proposer*)	$18.1	$20.0	$20.800	$17.1	$17.8	$93.8	
SUBTOTAL	$76.2	$84.3	$87.700	$72.1	$75.1	$395.4	
General Administration (9% of subtotal)	$6.9	$7.6	$7.9	$6.5	$6.8	$35.6	
PROJECT TOTAL	$83.1	$91.9	$95.6	$78.6	$81.9	$431.0	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	

COMMENTS:

FY12-16

Program Title: 16120114-I Conceptual Modeling
Team Leader: Tuula Hollmen

SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
Post-Doctoral Researcher - TBD		3.0	7000.0		21,000.0
					0.0
		Subtotal	7000.0	0.0	
				Personnel Total	$21,000.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
PI meeting in Anchorage	800.0	1	3	430.00	2,090.00
Modeling Workshop in Anchorage	800.0	1	3	430.00	2,090.00
Alaska Marine Science Symposium	200.0	1	6	230.00	1,580.00
					0.0
					0.0
				Travel Total	$5,760.0

FY16

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description		Contract Sum
Salary Support - PI Tuula Hollmen @ $15,300/mo x 2 months		30,600.0
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$30,600.0

Supplies Costs: Description	Supplies Sum
Supplies Total	$0.0

FY16

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B
CONTRACTUAL & Supplies DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Long-Term Monitoring of Marine Conditions and Injured Resources and Services - Synthesis Component
Team Leader: Tuula Hollmen

FORM 3B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Long term monitoring: Environmental drivers component - The Seward Line: Marine Ecosystem monitoring in the Northern Gulf of Alaska.

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Russell R Hopcroft, University of Alaska Fairbanks

Study Location: Gulf of Alaska shelf (south of Seward), and Prince William Sound

Project Website: http://www.gulfwatchalaska.org and https://www.sfos.uaf.edu/sewardline/

Abstract*:
The ocean undergoes year-to-year variability in the physical environment, superimposed on longer-term cycles, and potential long-term trends. These variations influence ocean chemistry, and propagate through the lower trophic levels, ultimately influencing fish, seabirds and marine mammals. Over the past 50 years the Northern Pacific appears to have undergone at least one clear "regime shift", while the last 18 years have seen multi-years shifts of major atmospheric indices, leaving uncertainty about what regime the coastal Gulf of Alaska is currently in. Regime shifts are often expressed as fundamental shifts in ecosystem structure and function, such as the 1976 regime shift that resulted in a change from a shrimp dominated fisheries to one dominated by pollock, salmon and halibut. Long-term observations are also critical to describe the current state, and natural variability inherent in an ecosystem at risk of significant anthropogenic impact. Given the potential for such profound impacts, this proposal seeks to continue multidisciplinary observations which began in 1997 along the Seward Line and in PWS that assess the current state of the Northern Gulf of Alaska, during 2012-2017. Such observations form critical indices of ecosystems status that help us understand some key aspects of the stability or change in upper ecosystems components for both the short and longer-term. By analogy, the weather has been studied for more than a hundred years, yet regular observations are still needed to know what is happening and what can be expected in the near future.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$98.1	$59.9	$100.5	$104.0	$107.7	$470.2

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$0.0	$0.0	$0.0	$300.0	$300.0	$600.0

** Funds expressed in $1000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

Long times-series are required for scientists to tease out pattern (and cause) from simple year-to-year variability. Like other regions, the Northern Pacific undergoes significant inter-annual variability, driven partially by variations in major climatic indices (e.g. El Niños, the Pacific Decadal Oscillation). Larger longer-term variations referred to as "regime shifts" have occurred in the past, and will likely occur again. Regime shifts are expressed as fundamental shifts in ecosystem structure and function, such as the 1976 regime shift that resulted in a switch within the Gulf of Alaska from a shrimp-dominated fishery to one dominated by pollock, salmon and halibut. Long-term observations are also critical to describe the current state, and natural variability inherent in an ecosystem at risk of significant anthropogenic impact. Given the potential for such profound impacts, the Seward Line Long-term Observation Program (http://www.sfos.uaf.edu/sewardline/) provides these critical observations on the current state of the Northern Gulf of Alaska ecosystem. Seward Line observations over the past 16 years have fundamentally revised our understanding of the coastal Gulf of Alaska ecosystem and allow us an appreciation of not only its major properties, but also their inter-annual variability. To date, we have observed both unusually warm and cold years, which influence the timing of the planktonic communities, but not necessarily their ultimate abundance and biomass.

During surveys conducted during this past year, we found that the anomalously warm water temperatures from fall 2014 have persisted throughout the winter along the Seward line. The average upper-100 m temperatures for the GAK stations were 0.9-1.3 °C above the 18-year mean for those stations, with the largest anomalies at the offshore end. Averaging 1°C along the line, this anomaly is very close to those observed during the 1998 and 2003 El Niño events. We also extended the line offshore to encompass stations GAK14 and GAK15. All offshore stations were sampled to 1000 m depth with the CTD.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

Project principal investigator, Dr. Russ Hopcroft, interacts with other PIs within Environmental drivers on a regular basis, allowing for cross-comparison of data and discussion of unusual events. In addition, Dr. Hopcroft servers on the Gulf Watch Alaska Science Coordinating Committee, and has regular phone conferences involved in program oversight

B. With Other EVOSTC-funded Projects

This project provides environmental context and indices to the EVOSTC funded Herring Research and Monitoring program.

C. With Trustee or Management Agencies

The Seward Line is funded by a consortium of the North Pacific Research Board, the Alaska Ocean Observing System and EVOTC Gulf Watch Program, and works in conjunction with the US Fish and Wildlife Service. It has recently started discussion for coordination with ADF&G (NAME) in addition to its ongoing interaction with NOAA (Phil Mundy).

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

This project revolves around executing multidisciplinary oceanographic cruises along the Seward Line and in PWS each May and September. The objectives that are met each cruise are:

1. Determine thermohaline, velocity, and nutrient structure of the Seward Line across the Gulf of Alaska shelf, and at stations throughout PWS
2. Determine phytoplankton biomass and size distribution (chlorophyll)

3. Determine the distribution and abundance of micro-zooplankton (starting in 2014)
4. Determine the distribution and abundance of meta-zooplankton
5. Opportunistically, determine rates of growth and egg production of selected key zooplankton species
6. Support determination of carbonate chemistry (i.e. ocean acidification)
7. Determine distribution and composition of seabirds (& marine mammals) along the Seward Line, PWS and Kenai coastline
8. Provide at-sea experience for graduate students within the University of Alaska

B. Changes to Project Design

All bottle-based measurements (i.e. nutrients, chlorophyll) have been discontinued at minor Seward Line stations to streamline cruise logistics and analysis costs. A new bottle carousel allows for additional bottles depth on each CTD cast.

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. Execute May 2016 cruise.
To be met by May 2016

Objective 2. Execute September 2016 cruise.
To be met by September 2016

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

Ongoing: *Analysis of samples and data, data submission*

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

May Cruise: *Complete specific tasks in Section III.*
Ongoing: *Analysis of samples and data*

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

September Cruise: *Complete specific tasks in Section III.*
Ongoing: *Analysis of samples and data*

FY 16, 4th quarter (November 1, 2016- January 31, 2017)

Ongoing: *Analysis of samples and data*
November: *Attend PI meeting, present findings*
January: *Attend AMSS, present findings*

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Through other Consortium funding, Dr. Seth Danielson (UAF), Dr. Suzanne Strom (WWU) and Dr. Kathy Kuletz (USFWS) are now co-PIs on the overall Seward Line project, but not directly funded by Gulf Watch Alaska.

VI. BUDGET

A. Budget Forms (Attached)

Provide completed budget forms.

B. Changes from Original Proposal

No changes

C. Sources of Additional Funding

The Seward Line is funded by a consortium of the North Pacific Research Board (~50%), the Alaska Ocean Observing System (~25%) and EVOTC Gulf Watch (~25%), and works in conjunction with the US Fish and Wildlife Service (Kathy Kuletz – in kind support).

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$28.8	$35.3	$68.8	$71.8	$75.1	$279.7	
Travel	$2.5	$2.6	$1.4	$1.5	$1.6	$9.5	
Contractual	$49.0	$3.0	$1.5	$1.5	$1.5	$56.5	
Commodities	$1.2	$3.0	$2.1	$1.5	$0.9	$8.7	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (will vary by proposer)	$8.6	$11.0	$18.4	$19.1	$19.8	$76.9	
SUBTOTAL	$90.0	$54.9	$92.2	$95.4	$98.8	$431.4	
General Administration (9% of subtotal)	$8.1	$4.9	$8.3	$8.6	$8.9	$38.8	
PROJECT TOTAL	$98.1	$59.9	$100.5	$104.0	$107.7	$470.2	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	

COMMENTS:

FY12-16

Program Title: 16120114-J Seward Line
Team Leader: R. Hopcroft

FORM 3A
NON-TRUSTEE AGENCY
SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Hopcroft, R.	Principal Investigator	0.5	14.21		7.11
Mathis, J.	co-Investigator	0.5	14.05		7.03
Post doctoral fellow	Investigator	3.0	6.99		20.97
Technician 1	zooplankton	1.0	9.86		9.86
Technician 2	zooplankton	2.0	10.79		21.58
Technician 3	chlorophyll	0.5	10.16		5.08
Technician 4	CTD	0.3	13.78		3.45
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	79.8	0.0	
				Personnel Total	$75.1

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (to cruise) - per diem only			16	0.03	0.48
Fairbanks to Seward (to cruise) - vehicle rental			1	1.10	1.10
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.58

FY16

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
shipping	1.0
CTD calibration	0.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$1.5

Commodities Costs:	Commodities
Description	Sum
project supplies	0.9
Commodities Total	$0.9

FY16

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY16

Program Title: Seward Line
Team Leader: R. Hopcroft

FORM 3B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Continuing the Legacy: Prince William Sound Marine Bird Population Trends

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Kathy Kuletz and Robb Kaler, US Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska

Study Location: Prince William Sound

Project Website: http://www.gulfwatchalaska.org/monitoring/pelagic-ecosystem/pws-marine-bird-population-trends/

Abstract*: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et al. and spans 1989-2014, and includes 13 years of boat-based surveys aimed at monitoring population trends of marine birds and mammals in Prince William Sound after the *Exxon Valdez* oil spill. Data collected will be used to examine trends from summer to determine whether populations in the oiled zone are increasing, decreasing, or stable, as well as to examine overall population trends for the Sound. Data collected from 1989 to 2012 indicated that pigeon guillemots (*Cepphus columba*) and marbled murrelets (*Brachyramphus marmoratus*) are declining in the oiled areas of Prince William Sound. We have found high inter-annual variation in numbers of some bird species and therefore recommend continuing to conduct surveys every two years. These surveys are the only ongoing means to evaluate the recovery of most of these injured marine bird species. Surveys would also benefit the benthic monitoring and forage fish monitoring aspects of the Long-term Monitoring Project as well as the Herring Project.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$206.5	$24.2	$211.1	$24.2	$215.7	$681.6

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$56.0	$22.0	$56.0	$22.0	$56.0	$212.0

*** Funds expressed in $1000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

In order to assess population trends in the years following the Exxon Valdez Oil Spill (EVOS), the objectives of the proposed project "Continuing the Legacy: Prince William Sound Marine Bird Population Trends are (1) determine population abundance, with 95% confidence limits, of marine bird populations in Prince William Sound during March and July 2012, 2014 and 2016 in both oiled and unoiled regions; and (2) determine population abundance, with 95% confidence limits, of marine bird populations in Prince William Sound during March and July 2012, 2014 and 2016 for Prince William Sound as a whole.

During the past reporting period, Daniel Cushing completed his degree of Master of Science at Oregon State University and his thesis titled "Patterns of Distribution, Abundance, and Change over Time in the Marine Bird Community of Prince William Sound, Alaska, 1989-2012" (Cushing 2014). Using data collected during small boat surveys (1989-2012), Cushing (2014) used taxon- and community-centric approaches to examine patterns of marine bird distribution and abundance in Prince William Sound and found marine bird communities as a whole to be spatially structured along a primary onshore-offshore environmental gradient, and secondarily structured along an estuarine-marine environmental gradient. Cushing (2014) also investigated spatial habitat associations and temporal change of *Brachyramphus* murrelets and found that abundance estimates for both marbled murrelets (*Brachyramphus marmoratus*) and (*B. brevirostris*) decreased by more than two-thirds over the study period. There was no evidence that rates of change differed along environmental or geographic gradients and no evidence that changes in seasonal patterns of abundance occurred. Using marine bird data collected in July 2014, in FY15 we will continue to explore the hypothesis that climate change has differentially affected nearshore and offshore components of PWS food webs, and how this may have contributed to the failure of some taxa to recover from the population injury caused by the EVOS.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

This component will provide the data on marine bird and mammal populations for the: (1) Nearshore Benthic Project; (2) Herring Research and Monitoring Program, and (3) the Forage Fish Distribution and Abundance Project. Long-term population trend information on seabird species (three which rely on Pacific Herring; Pigeon Guillemots, Kittlitz's Murrelets, and Marbled Murrelets) is a critical tool for determining the efficacy of policy and management actions affecting the Gulf of Alaska marine ecosystem.

Collaborating with the Forage Fish Distribution and Abundance project, we plan to examine the utility of combining aerial survey data, hydroaccoustic survey data, and PWS-wide marine bird survey data to determine spatial overlap and identify "hot spots" to further understand relationships between forage fish distribution and marine habitats.

B. With Other EVOSTC-funded Projects

The proposed project complements the Council-funded effort to restore Pigeon Guillemot to the Naked Islands (Naked, Peak, and Storey islands). Dr. David Irons is a Principle Investigator for both the PWS marine bird survey as well as the Pigeon Guillemot restoration study.

C. With Trustee or Management Agencies

The proposed project supports the US Fish and Wildlife Service's Migratory Bird Management mission to advance the conservation of migratory birds. The project will also inform other land management agencies (US Forest Service, National Park Service, Bureau of Land Management, State of Alaska) with

lands and waters adjacent to our study area. Additionally, Co-PI Dr. Kathy Kuletz (USFWS) is also a PI of the seabird component for two other long-term monitoring projects that complement the PWS marine bird survey and will allow us to examine oceanographic and plankton data in conjunction with seabird distribution and relative abundance, with a seasonal component, across the Gulf Watch study area and will inform the fisheries management process in the Gulf of Alaska.

(1) Seabird surveys are a sub-award of the 'Seward Line' project funded by the North Pacific Research Board (Project 1427, "Measuring the pulse of Gulf of Alaska: Oceanographic observations along the Seward Line"; lead PI, Dr. R. Hopcroft, UAF). Dr. Kuletz coordinates pelagic surveys of marine birds in conjunction with the oceanographic and plankton surveys. The project includes the transit along the outer coast of the Kenai Peninsula between Homer and Seward, the Seward Line (which runs to the shelf break), and transits between stations throughout western PWS. Two sampling cruises (May and September) are conducted each year for the next five years, with plans to continue additional years, pending funding.

(2) Seabird surveys in Lower Cook Inlet funded by the Bureau of Ocean Energy Management (BOEM; Intra-agency Agreement No. M14PG00031, "Seabird Abundance and Distribution with Respect to Ecological Processes in Lower Cook Inlet"). This project collects data for the upper trophic level component of the BOEM environmental studies program, in partnership with an existing multidisciplinary monitoring program (Monitoring temporal and spatial trends in lower Cook Inlet and Kachemak Bay waters, Gulf Watch, PIs A. Doroff (KBNERR) and K. Holderied (NOAA)). The USFWS/BOEM marine bird surveys are conducted in conjunction with oceanographic and plankton sampling across four transect lines in Lower Cook Inlet, four times per year (spring, summer, fall, winter), 2012 - 2016.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

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

B. Changes to Project Design

No changes have been made to the project design

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. Determine population abundance, with 95% confidence limits, of marine bird populations in Prince William Sound during July 2012, 2014 and 2016 in both oiled and unoiled regions
To be met by September 2016

Objective 2. Determine population abundance, with 95% confidence limits, of marine bird populations in Prince William Sound as a whole during July 2012, 2014 and 2016
To be met by December 2016

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

February 01: Begin paper work process for hiring project personnel
Begin logistical planning for lodging and fuel caches
Begin paper work process for contractual agreements

March 01 – April 31: Continue follow-up with Human Resource department for hiring of project personnel; interview and hire project personnel
Continue follow-up with Contracting department for status of contractual project support

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)
May 15: Prepare for field season
July 01-31: Conduct field work

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)
August 01: Clean and store field gear, survey vessels, and equipment
Begin survey data management (QA/QC) and analysis
September 01: Data analysis and summary report preparation

FY 16, 4th quarter (November 1, 2016- January 31, 2017)
November 01-December 31: Report writing
November 18: Attend annual PI meeting

V. PROJECT PERSONNEL – CHANGES AND UPDATES

David Irons has been co-PI this project since it was funded by Gulf Watch Alaska in 2012. David retired from the USFWS in May 2015 and will serve in an advisory capacity on this project. David is an adjunct professor at Oregon State University, Corvallis, Oregon.

VI. BUDGET

A. Budget Forms

Forms provided separatel

B. Changes from Original Proposal

There are no changes to our FY16 funding request.

C. Sources of Additional Funding

Salary contribution, U.S. Fish and Wildlife Service
- Kathy Kuletz salary (GS-12, $11,000 per month) for 2 months/year = $22K

Kathy will provide the project leader guidance and assist with data analysis and reporting. Additionally,

Equipment contribution, U.S. Fish and Wildlife Service
- Survey vessels (three, 25-ft Boston Whalers) at $300/day/boat for 20 days = $18K

Three survey vessels (and one vessel as an alternate) will serve as the survey platform for the marine bird and mammals surveys conducted across PWS.
- Equipment (computers and software, immersion suits, electronics, etc.) = $12K

Each survey vessel has two survey laptop computers (for data collection), one salinity meter (for measuring salinity, sea surface temperature, and ocean pH), emergency equipment (for emergency evacuation from survey vessel; immersion suits, emergency locator beacon, satellite telephone, hand-held VHF radios), and Global Positioning Satellite receivers and associated software and hardware for data collection).
- GSA vehicle lease and fuel (full-size diesel truck for towing survey vessels) = $4K

Total in-kind contribution from U.S. Fish and Wildlife Service for FY 16 = $56K

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$100.0	$22.2	$100.0	$22.2	$100.0	$344.3	
Travel	$11.8	$0.0	$11.8	$0.0	$11.8	$35.4	
Contractual	$37.1	$0.0	$37.1	$0.0	$37.1	$111.3	
Commodities	$34.6	$0.0	$38.8	$0.0	$43.0	$116.3	
Equipment	$6.0	$0.0	$6.0	$0.0	$6.0	$18.0	
SUBTOTAL	$189.4	$22.2	$193.6	$22.2	$197.8	$625.3	
General Administration (9% of subtotal)	$17.0	$2.0	$17.4	$2.0	$17.8	$56.3	
PROJECT TOTAL	$206.5	$24.2	$211.1	$24.2	$215.7	$681.6	
Other Resources (Cost Share Funds)	$56.0	$22.0	$56.0	$22.0	$56.0	$212.0	

COMMENTS: In-kind contribution from USFWS includes $11K/year in salary for Irons and $11K/year in salary for Kuletz. We proposed to hire a Project Leader in FY 13 but had difficulty filling the position due to the federal hiring freeze. In March 2014, we received approval of a hiring request waiver and were able to hire Project Leader (Robb Kaler).

FY12-16

Program Title: 16120114-K Continuing the Legacy: Prince William Sound Marine Bird Population Trends.
Team Leader: Robert Kaler

FORM 4A
TRUSTEE AGENCY SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Unknown - Project Leader	PWS Marine Bird Population Trends	8.0	7.4		59.2
Unknown - Supervisory Biological Science Tec	PWS Marine Bird Population Trends	5.0	5.0		25.0
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Unknown - Biological Science Technician	PWS Marine Bird Population Trends	1.5	3.5		5.3
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
Volunteer	PWS Marine Bird Population Trends				0.0
					0.0
					0.0
					0.0
		Subtotal	22.9	0.0	
				Personnel Total	$100.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Truck and boat tunnel fee (Portage - Whittier)	0.010	8			0.08
Per diem ($5/day), 9 people, 25 days summer			225	0.005	1.13
Per diem (travel rate), 9 people, 9 people, 2 days summer; 6 people for 3 days			36	0.175	6.30
Lodging, 6 nights, 3 rooms @ $120/night/room (Cordova)			18	0.120	2.16
Volunteer Tavel to Anchorage 2 people	1.000	2	2	0.075	2.15
					0.00
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$11.8

FY16

Program Title: Long-term monitoring: Pelagic monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends.
Team Leader: Irons and Kuletz
Agency: USFWS

FORM 4B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
Charter vessel (summer - 7 days @ 3,500/day)	24.5
Harbor fees	0.6
Emergency boat repairs and parts	12.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$37.1

Commodities Costs:	Commodities
Description	Sum
Boat fuel (70 gal/boat/day) 60 boat-days summer @ $7/gal	29.40
Outboard oil (4 gal/boat/survey), 3 boats @ $20/gal	0.24
Food ($20/person/day) 9 people 13 days in summer	2.34
Misc. Commodities (cleaning supplies, replacement of emergency locator beacons, etc.	5.00
Boat Maintenance	6.00
Commodities Total	$43.0

FY16

monitoring component - Continuing the Legacy: Prince William Sound Marine Bird Population Trends.
Team Leader: Irons and Kuletz
Agency: USFWS

FORM 4B CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Emergency replacement of equipment	1.0	6.0	6.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$6.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY16

monitoring component - Continuing the Legacy:
Prince William Sound Marine Bird Population Trends.
Team Leader: Irons and Kuletz
Agency: USFWS

FORM 4B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

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

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Brenda Konar and Katrin Iken (UAF)
Co-operating Investigator: Angie Doroff (UAA, KBNERR)

Study Location: Kachemak Bay, lower Cook Inlet

Project Website (if applicable): http://www.gulfwatchalaska.org/

Abstract*: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services. As part of this component, we monitor rocky intertidal, seagrass and clam gravel beach systems as well as the sea otter abundance and diet in Kachemak Bay. This component is complementary to work being conducted under this program in Prince William Sound, Kenai Fjords and Katmai.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA*):

FY12	FY13	FY14	FY15	FY16	TOTAL
$48.1	$48.2	$48.1	$48.1	$47.4	$239.8

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

** Funds expressed in $1000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

The purpose of this study is to provide long-term monitoring data for the Gulf of Alaska regions, specifically the nearshore environment that is most affected by anthropogenic influences such as oil spills and to climate fluctuations and changes. The focus of the Gulf of Alaska Long-Term Monitoring program is on Prince William Sound but a larger area has to be monitored to be able to evaluate if any observed patterns in community dynamics are locally isolated and specific to Prince William Sound or reflect larger-scale Gulf-wide patterns. Kachemak Bay, contiguous to lower Cook Inlet, is one of the reference sites for Prince William Sound and is being monitored for rocky intertidal communities, seagrass beds, clam and mussel communities as well as sea otter abundance and diets. We find that Kachemak Bay communities are similar to Prince William Sound but they also differ in many aspects. These similarities and differences are being used to create a better understanding of the potential biological and environmental drivers that are structuring these communities. For biological drivers, we have been monitoring mussel recruitment and mortality in at different spatial scales Kachemak Bay. We are currently working on investigating the role of static drivers (such as substrate, and other non-changing surrounding environmental conditions) on rocky intertidal community structure across the northern Gulf of Alaska, including Kachemak Bay, Katmai, Kenai, and Prince William Sound. From this, we will be able to separate these effects from those of more dynamic drivers (e.g., climate or anthropogenic related) in the future. Control regions outside of Prince William Sound, such as Kachemak Bay, are essential to determine spatial variability scales and scaling the impact of various drivers of benthic communities.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

This project links very tightly with the Prince William Sound, Kenai, and Katmai monitoring. For the monitoring of Prince William Sound, it is essential to have control sites for comparison. These control sites will allow for broader-scale questions to be asked and patterns assessed about community dynamics and drivers.

B. With Other EVOSTC-funded Projects

This project links with the Herring project funded by the EVOSTC. Herring are known to use kelp in the nearshore environment as essential spawning grounds, so the information collected through the nearshore benthic monitoring work is an important link to the life cycle of this important forage fish.
The Kachemak Bay component also builds on earlier work funded by the EVOSTC for nearshore biodiversity sampling under the NaGISA project (Rigby et al. 2007). Those historical data are comparable to those collected now and build important components of a time series starting in 2003. Data management is shared for both historical and ongoing projects under the AOOS workspace and data portal.

C. With Trustee or Management Agencies

Within the sea otter component of this project we have partnerships with the USFWS and USGS for aerial-based population surveys. The USFWS Marine Mammals Management, Alaska Maritime National Wildlife Refuge, and the Alaska Marine Mammal Stranding Network all contribute to monitoring the sea otter mortality trends in the Kachemak Bay area. USFWS is conducting regular beach surveys for stranded live and dead sea otters on the north side of the bay (contact: Joel Garlic-Miller). The Marine Mammal Stranding Network works with the Alaska Maritime National Wildlife Refuge and incorporates students from the Kachemak Bay Campus to fill this monitoring role year-around.

In summer 2015, we started a pilot project under Bureau of Ocean and Energy Management (BOEM) funding (contact: Cathy Coon) to investigate rocky intertidal and shallow subtidal communities in western Cook Inlet. We are using the same protocols for some of this work as we use for the Gulf Watch Alaska program, thus extending the spatial range of this work farther across Cook Inlet, and linking to BOEM's interests in the region based on the oil and gas extraction plans in upper Cook Inlet.

In summer 2014 and 2015, we conducted a pilot project with the Coastal Marine Institute/BOEM to explore the possibilities of using aerial drones to take photographs so that we can extend the spatial monitoring of intertidal beaches and seagrass beds. We are currently analyzing these photographs to determine how the resolution compares between drone photographs and having scientists in the field taking the data. We are also comparing data between the typical 50 m Gulf Watch transect and longer transects that can be flown by a drone to determine what additional information can be obtained with longer transects.

In summer 2015, we conducted a proof of concept study with USGS to determine the feasibility of using aerial drones to observe foraging sea otters. To assess the feasibility of this tool, we flew drones over resting and foraging otters and documented the focal animal's response to the drone. This was a success in that the drones could get close enough to the otters to video them without altering the otter's behavior, especially for single animals. In fact, most of the otters we observed did not pay any attention to the drones and no disturbance of marine birds in proximity to focal animals was documented. In Kachemak Bay, approximately 50% of forage observations were > 1 km from shore for telemetered sea otters (Doroff and Badajos 2010), which limits the effectiveness of focal animal sampling from shore-based observations; if developed, this tool could expand the effectiveness of determining sea otter diet in habitats with broad expanses of shallow water. We are now seeking funding to extend this study to expand the monitoring capability for sea otter forage observations.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

1) Map sea otter spatial use patterns in Kachemak Bay to inform long-term monitoring studies of benthic habitat use in the region.
2) Determine the diet and dietary shifts of sea otters.
3) Determine trends in sea otter mortality.
4) Determine trends in the abundance and distribution of rocky intertidal plants and invertebrates
5) Determine trends in the abundance and size frequency of clams on gravel beaches. Utilize data from these sampling efforts to validate deductive bivalve habitat models being developed for Kachemak Bay.
6) Determine trends in the abundance and distribution of seagrass plants and invertebrates.
7) Determine trends in selected environmental parameters and relate them to #1-6 above.

With the outlook of continuing this pattern of monitoring for up to 20 years, we will continue field sampling in year 5 of the project to avoid data gaps. However, we will also focus on synthesis of the first five field years; specifically, we will complete a publication of the influences of static drivers on rocky intertidal community structure. Additionally, we will continue to work on assembling nearshore environmental data and assessing how/if they relate to patterns observed in the offshore Gulf of Alaska region. Lastly, we will follow the population dynamics of select intertidal organisms in Kachemak Bay, specifically mussels, to understand their abundance, growth, and mortality as an important prey item for sea otters.

B. Changes to Project Design

There have been no substantive changes to this project. We have experienced some challenges with the recovery of data loggers that are either removed by inclement weather or curious visitors to the beaches. Hence, the collection of temperature information alongside the biological information is not progressing as well as anticipated. Since the Kachemak Bay Research Reserve maintains long-term temperature monitoring in three locations in Kachemak Bay we are confident that we can obtain relevant and appropriate temperature data from those records for those times when we are missing data.

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. Monitor intertidal communities in Kachemak Bay.
To be done annually from 2012-2016, to be met by annually September 2016.

Objective 2. Monitor sea otter diet annually in Kachemak Bay.
To be done annually from 2012-2016, to be met by annually December 2016.

Objective 3. Synthesize temporal (annual) patterns in intertidal communities and their relation to select environmental variables and in sea otter diet in Kachemak Bay.
To be met by January 2017.

B. Measurable Project Tasks for FY 16

Specify, by each quarter of each fiscal year, when critical project tasks (for example, sample collection, data analysis, manuscript submittal, etc.) will be completed, as submitted in your original proposal. Please identify any substantive changes and the reason for the changes. Please format your schedule as in the following example:

FY 15, 1st quarter (February 1, 2016 - April 31, 2016)

February-April, 2016 — *Plan field sampling on intertidal communities, conduct monthly sea otter scat sampling*

FY 15, 2nd quarter (May 1, 2016-July 30, 2016)

May-June 2016 — *Conduct field sampling on intertidal communities and sea otter diet*
By July 30: — *Enter data from field sampling, continue sea otter sampling*

FY 15, 3rd quarter (August 1, 2016 – October 31, 2016)

November 30: — *Continue data entry and analysis, project presentation at annual PI meeting, discussions with collaborators on joint synthesis products*

FY 15, 4th quarter (November 1, 2016- January 31, 2017)

January 31: — *Report writing, prepare presentation at scientific conference (Alaska Marine Science Symposium), continue work on synthesis products*

V. PROJECT PERSONNEL – CHANGES AND UPDATES

There are no changes to the project personnel

VI. BUDGET

A. Budget Forms (Attached)

B. See budget form provided separately

C. Changes from Original Proposal

Total funding request does not differ from the original proposal; however, internal modifications have been made to funds of various categories. Specifically, we have increased travel funds to accommodate greater travel needs to meet with PIs and present at conferences.

D. Sources of Additional Funding

None.

References

Doroff A. M. and O. Badajos. 2010. Sea otter (Enhydra lutris kenyoni) survival and movement patterns in Kachemak Bay, Alaska 2007-2010. Final report to U.S. Fish and Wildlife Service Marine Mammals Management 1011 E.Tudor Rd, Anchorage, AK 99503. 63pp

Rigby PR, K Iken and Y Shirayama. 2007. Sampling Biodiversity in Coastal Communities NaGISA Protocols for Seagrass and Macroalgal Habitats- A NaGISA Handbook. Japan: Kyoto University Press

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$20.0	$20.7	$21.3	$22.0	$21.8	$105.8	
Travel	$1.0	$1.0	$1.0	$1.0	$1.0	$5.0	
Contractual	$6.4	$5.9	$5.2	$4.5	$4.5	$26.5	
Commodities	$2.1	$2.0	$2.0	$2.0	$1.5	$9.6	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (will vary by proposer)	$14.6	$14.6	$14.6	$14.6	$14.7	$73.1	
SUBTOTAL	$44.1	$44.2	$44.1	$44.1	$43.5	$220.0	
General Administration (9% of subtotal)	$4.0	$4.0	$4.0	$4.0	$3.9	$19.8	
PROJECT TOTAL	$48.1	$48.2	$48.1	$48.1	$47.4	$239.8	
Other Resources (in kind Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	

COMMENTS:

FY12-16

Project Title:16120114-L Kachemak Bay Intertidal
Team Leader: Konar/IkenF

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Brenda Konar	PI	0.5	14.6		7.3
Katrin Iken	co-PI	0.5	13.5		6.8
MS Graduate Student	Student	1.8	4.3		7.7
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	32.4	0.0	
				Personnel Total	$21.8

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Travel to Kasitsna Bay Laboratory	1.0	1			1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.0

FY16

Project Title:15120114-L Kachemak Bay Intertidal
Team Leader: Konar/IkenF

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
Kasitsna Bay Laboratory Fees	0.5
Angie Doroff KBNERR	4.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$4.5

Commodities Costs:	Commodities
Description	Sum
Project Supplies	0.5
Data Loggers	1.0
Commodities Total	$1.5

FY16

Project Title:15120114-L Kachemak Bay Intertidal
Team Leader: Konar/IkenF

FORM 3B
CONTRACTUAL &
COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY16

Project Title:15120114-L Kachemak Bay Intertidal
Team Leader: Konar/IkenF

FORM 3B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Title: Long-term Monitoring: Pelagic monitoring component - Long-term killer whale monitoring in Prince William Sound/ Kenai Fjords

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s):): Craig O. Matkin, Executive Director, North Gulf Oceanic Society 3430 Main St. Ste. B1 Homer, Alaska 99603 907 202-2579

Study Location: Prince William Sound and Kenai Fjords

Project Website: www.whalesalaska.org and North Gulf Oceanic Society on Facebook

Abstract*:

The proposed project is a continuation of the annual monitoring of AB pod and the AT1 population killer whales in Prince William Sound-Kenai Fjords. These groups of whales suffered significant losses at the time of the oil spill and have not recovered at projected rates. Monitoring of all the major pods and their current movements, range, feeding habits, and contaminant levels will help determine their vulnerability to future perturbations, including oil spills. The project also extends the scope of the basic monitoring to include a remote satellite tagging program used to examine habitat preference, feeding ecology and assist in relocating whales for feeding studies. It continues examination of feeding habits using observation, prey sampling and innovative chemical techniques. The study will continue to delineate important habitat, variations in pod specific movements and feeding behavior within a temporal and geographic framework. We will examine the role of both fish eating and mammal eating killer whales in the near-shore ecosystem and their impacts on prey species. Community based initiatives, educational programs (including our websites and Facebook page), and programs for tour boat operators will continue to be integrated into the work to help foster restoration by improving public understanding and fostering appreciation and reducing harassment of the whales

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$7.2	$132.3	$132.3	$132.3	$132.3	$536.1

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$23.5	$23.5	$23.5	$23.5	$23.5	$117.5

** Funds expressed in $1000 increments*

Date: 1 September 2015

I. EXECUTIVE SUMMARY

Both resident ecotype (AB pod) and transient ecotype (AT1 population) killer whales suffered significant mortalities following the *Exxon Valdez* oil spill in 1989. AB pod is recovering after 26 years but has still not reached pre-spill numbers. The AT1 population is not recovering and may be headed toward extinction. This project has determined that killer whales are sensitive to perturbations such as oil spills, but has not yet determined the long term consequence (which may include extinction) or the recovery period required. As an apex predator, this species (both fish and mammal eating types) has important role in the ecosystem; additionally, they are a primary focus of viewing by a vibrant tour boat industry in the region. Data from this project is used by tourboats to enhance viewers experience and understanding of the local environment and fauna. Unlike many cetaceans, killer whales can be closely monitored. This is a unique opportunity to continue a comprehensive database initiated in the early 1980's for what is a keystone marine species in the region. The importance of long-term killer whale monitoring has been borne out by companion studies other regions such as Puget Sound and British Columbia.

In this project we use photoidentifcation, prey sampling, biopsy sampling, and satellite tagging to develop population parameters and to study feeding ecology, range, and distribution. Analysis includes population dynamics, genetics, lipid /fatty acids in blubber, environmental contaminants, and development of location and dive data from tags. Although we focus on the southern Alaska resident and AT1 transient populations which were impacted by the spill, the study also includes the other two recognized populations in the region, the Gulf of Alaska transients and offshore killer whales and contributes substantially to the NMFS;/NOAA killer whale stock assessments.

Data is collected during a minimum 50 day field season from May through October from the R.V. Natoa, although opportunistic photographic data is contributed from other collaborating vessels. This is the continuation of a long-term project initiated over 30 years ago and has benefited from continued support of coastal communities of the north Gulf coast of Alaska.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

We have been and will continue to be active collaborators on the studies examining the interaction of humpback whales and herring (John Moran and Jan Straley, PIs) We have contributed our substantial long-term humpback whale photoidentification database to their analysis. We will continue to collect humpback whale fluke identification data from our research vessel and share research platforms when possible. When possible the proposed study will be integrated with near shore studies that focus on sea otters and with the oceanographic studies of the Alaska Coastal Current. We recently collaborated on a publication with members of the Nearshore component of Gulf Watch:

Bodkin, J.L., D. Esler, S.D. Rice, **C.O. Matkin,** and B. E. Ballachey. 2014. The effects of spilled oil on coastal ecosystems: lessons from the *Exxon Valdez* spill. B. Maslo and J.L. Lockwood eds. In: Coastal Conservation, Cambridge University Press, U.K.

B. With Other Council-funded Projects

Although we have indirect links to projects in the herring program, we do not directly share equipment, personnel or assist in data collection in these other Council funded projects.

C. With Trustee or Management Agencies

This work directly contributes and is closely coordinated with NMFS stock assessment work for North Pacific killer whales. We are currently collaborating on a major revision of North Pacific killer whale stocks. One of our staff (Dr. Kim Parsons) is the lead genetics specialist in this project and is

using samples collected by this project in her analysis. We are also contributing photoidentification and acoustic data that are being used to look not only at stock definition, but trends in abundance Dr. Paul Wade (National Marine Mammal Laboratory) is the lead in this endeavor which will result publications coauthored by Matkin, the P.I. of this project.

We work with National Marine Fisheries Service region and Aleria Jensen in Juneau to continue education of tour boat operators that view killer whales, particularly in the Kenai Fjords region

We work directly with the Alaska Sea Life Center and Dr. Russ Andrews on the ARGOS tagging project and this data is also being incorporated into Stock Assessments and stock definition of killer whales in the Gulf of Alaska and western Alaska

We participate in an internship program with University of Alaska, "Semester by the Sea" program for undergraduates through KPC-UAA

Finally, we collaborate with the Stranding Network at the Alaska Sea Life Center by assisting UAA professor Dr. Debby Tobin in examining and sampling stranded animals, which has included killer whales from the populations studied in this project.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

1) Photo-identification of all major resident pods and AT1 transient groups that use Prince William Sound/Kenai Fjords on an annual basis. Realistically, some pods are documented on a biennial basis, despite annual field effort. Extension of life histories of individuals, update identification catalogues and update of population parameters and population model.
2) Collection of blubber samples for chemical monitoring of PCBs, DDT's and PBDE's, lipids and fatty acids and stable isotope values to gauge changes in contaminant loads as well as explore changes in feeding habits. Most analytical costs are borne by NOAA, NWFSC, Seattle.
3) Collection of fish scale samples and marine mammal tissue from kill sites to describe and monitor feeding habits
4) Collection of tissue samples for genetic analysis. Primarily population analysis but potentially other genetic markers (Genetic analytical costs paid by NGOS/NMML)
5) Tracking and dive profiles of individuals/pods using ARGOS satellite telemetry. Examination of range and use of time/depth features to examine feeding patterns and diel behavior.
6) Determine details of range of pods/populations using both ARGOS and photoidentification data and identify important habitat on a pod specific basis

B. Changes to Project Design

There are no substantive changes in project design or objectives, only changes in emphasis. There has been some re-alignment in emphasis and budget to insure that basic photoidentification and population dynamics work is not compromised by other aspects of the project. Tagging is being reduced to focus primarily on feeding ecology. We have shifted field work to focus on periods of highest historic rate and location of encounters with killer whales to emphasize the population work, which reduces our ability to characterize feeding ecology over the broad course of the season

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. To prepare for and complete field collection of data, including identification photos, behavioral observations, prey sampling and biopsy sampling and ARGOS satellite tag attachments. Field work will begin in May 2016 and end by October 2016.

Objective 2. Conduct photoidentification analysis and update catalogues and individual registries. Analyze blubber samples, prey samples, skin samples, and plot results of tagging efforts. To be completed by May 2017

Objective 3. Update all databases and compile and conduct statistical analysis on data for publication and/or compilation of annual report. Completed by May 2017. Update website (Facebook site is updated constantly over the year) and present results

B. Measurable Project Tasks for FY 16

FY16, (February 1, 2016 - April 31, 2016)

Finish analysis of photographs from fieldwork, update catalogues, work up satellite tag data in GIS format and final update of databases. Lipid/fatty acid, contaminant, stable isotope, prey sample and genetic analysis completion. Prepare for fieldwork.

FY16, 2nd quarter (May 1, 2016-July 30, 2016)

Final prep for fieldwork Conduct fieldwork in May- June (30+ days)

FY16, 3rd quarter(August 1, 2016 – October 31, 2016)

Conduct fieldwork in August-September (20+ days) Compile 2015 data and samples. Annual report and budget.

FY16, 4th quarter (November 1, 2016- January 31, 2017) Update of databases and begin analysis of tagging and field data analysis. Begin identifications from photo data collected in second and third quarter.. Lipid/fatty acid, contaminant, stable isotope and genetic analysis will be initiated. Attend Annual Gulf Watch PI meeting.

V. PROJECT PERSONNEL – CHANGES AND UPDATES

There are no major staffing changes at this time, although Dan Olsen (graduate student at UAF Juneau) is being trained to become a principle in the project and Eva Saulitis will have backup in her role as primary field support due to health issues.

VI. BUDGET

A. Budget Forms

Forms provided seperately.

B. Changes from Original Proposal

There has been reduction in some budget categories that reflects reduced emphasis and completion of work using tagging in examining range and habitat use. There is increased emphasis on feeding habit work (prey sampling/time depth tags) and on genetic analysis expansion. There a slightly has reduced the involvement of the Northwest Fisheries Science Center and reduced purchases of ARGOS tags. This has resulted in some realignment in budget but little change in overall goals. There has NOT been an increase in total budget.

C. Sources of Additional Funding

The Northwest Fisheries Science Center contributes substantial analytical and salaried employee time (approximately $10,000 in kind annually) to aspects of our project. The Norcross Wildlife Foundation, the Stan Stephens Memorial Fund, and other donors contribute funds that assist in for purchase equipment. The National Marine Mammal Lab contributes approximately $6,000 in genetic analysis costs annually. The North Gulf Oceanic Society contributes approximately $10,000 annually in kind for additional vessel time. The Alaska Sea Life center contributes salaried time and ARGOS tracking site expenses (via Russ Andrews) to the project.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$0.0	$34.3	$37.0	$37.0	$37.0	$145.3	
Travel	$0.0	$1.7	$2.7	$2.7	$2.7	$9.8	
Contractual	$0.0	$38.5	$41.5	$44.5	$44.5	$169.0	
Commodities	$6.0	$35.6	$29.2	$26.2	$26.2	$123.2	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (will vary by proposer)	$0.6	$11.0	$11.0	$11.0	$11.0	$44.6	
SUBTOTAL	$6.6	$121.4	$121.4	$121.4	$121.4	$491.9	
General Administration (9% of subtotal)	$0.6	$10.9	$10.9	$10.9	$10.9	$44.3	
PROJECT TOTAL	$7.2	$132.3	$132.3	$132.3	$132.3	$536.1	
Other Resources (In kindFunds)	$23.5	$23.5	$23.5	$23.5	$23.5	$117.5	

Comment: Other resources include 15,000 in donated vessel time by NGOS, Approximately 5000 in equipment funds from Norcross Foundation and solicited donations. Approximately 5000 of analytical service is provided annually by Northwest Fishery Science Center, Environmental Contaminant Laboratory.

FY12

Program Title: 16120114-M Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Personnel Costs:			Months	Monthly		Personnel
Name	Project Title		Budgeted	Costs	Overtime	Sum
						0.0
Craig Matkin	P.I. Field Biologist		5.0	5.1		25.5
Eva Saulitis	Field Biologist/Data analysis		2.5	3.5		8.8
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
			Subtotal	8.6	0.0	
					Personnel Total	$34.3

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
Attend annual Alaska Marine Science Symposium	0.9	1	3	0.2	1.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.5

FY16

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
Vessel Lease (R.V. Natoa/ 40 days @500/day)	20.0
NWFSC Environmental Contaminant Lab, Analytical Fees	12.0
GIS/Statistical Analysis	3.0
Photoidentification/Catalogue	3.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$38.5

Commodities Costs: Description	Commodities Sum
Misc tagging and biopsy supplies	2.0
8 satellite tags @3000 apiece	24.0
Field Food ($40/day for 40 days)	1.6
Fuel ($150/day for 40 days)	6.0
Film, Photo processing	1.8
Field Communication, Tracking, Shipping, and Misc supplies	0.8
Commodities Total	$36.2

FY16

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY16

Program Title: Long Terrm Killer Whale Monitoring in Prince William Sound/Kenai Fjords
Team Leader: Craig Matkin

FORM 3B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Long-term Monitoring: Pelagic Monitoring Component - Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound. 13120114-N

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): John R. Moran (NOAA) and Janice M. Straley (UAS)
Collaborating investigator: Terry Quinn (UAF)

Study Location: Prince William Sound

Project Website (if applicable): www.gulfwatchalaska.org

Abstract*: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al. We will evaluate the impact by humpback whales on Pacific herring populations in Prince William Sound. Following protocols established during the winters of 2007/08 and 2008/09(EVOSTC project PJ090804). We will continue to monitor the seasonal trends and abundance of humpback whales in Prince William Sound. Prey selection by humpback whales will be determined through acoustic surveys, visual observation scat analysis and prey sampling. Chemical analysis of blubber samples (stable isotopes and fatty acid analysis) will provide a longer term perspective on whale diet and shifts in prey type. These data will be combined in a bioenergetic model to determine numbers of herring consumed by whales, with the long term goal of enhancing the age structure modeling of population with better estimates of predation mortality.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$127.4	$128.8	$139.6	$141.6	$54.4	$591.9

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$25.0	$75.0	$75.0	$25.0	$25.0	$225.0

** Funds expressed in $1000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

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

To date we have completed 16 surveys in Prince William Sound (101 days at sea) and have developed a conceptual model of the relationship between humpback whales and herring in the Sound. Although there is some inter-annual variation in the predation intensity, it appears that humpback whales continue to be major predators on Prince William Sound herring.

II. COORDINATION AND COLLABORATION

A. Within an EVOTC-Funded Program

- Killer whale and humpback whale photos were exchanged with Craig Matkin. This collaboration expands the temporal and spatial scope of both projects.
- Acoustic were deployed on our April 2015 trip in coordination with the Herring Program.
- Winter Seabird Survey observers were present on whale surveys.
- The Gulf Watch Alaska pelagic team PIs (Moran, Straley, Arimitsu, Piatt and Bishop) collaborated to facilitate a broader understanding of humpback whale and seabird foraging dynamics and forage fish availability in Prince William Sound.
- We combined efforts with the Forage Fish Team and Winter Seabird Team For an intensive 2 vessel survey of biological "hot spots" within PWS in September 2014.

B. With Other EVOSTC-funded Projects

There was no collaboration with other Trustee funded projects other than those listed above.

C. With Trustee or Management Agencies

- Pollock were collected during whale surveys for the AFSC recruitment energetics project.
- Brand re-sights and haul-out photos of Steller sea lions were provided to ADF&G.
- Data on whale locations and prey quality was given to the review Steller Sea Lions Critical Habitat Workshop held in Seattle, January 2015.
- University of Alaska Fairbanks - Brianna Witteveen: Humpback fluke data sharing

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

1) *Population estimates of humpback whales through the use of photographic mark- recapture models.* Knowing the number of whale present in PWS is essential for assessing their impact on the PWS ecosystem.

2) *Monitor the seasonal trends of humpback whales in Prince William Sound relative to prey.* EVOSTC project PJ090804 identified an correlation between the movements of whales and herring in PWS

3) *Estimate inter-annual trends in humpback whale abundance.* This objective allows us to determine if the conclusion from EVOSTC project PJ090804 are an anomaly or typical whale behavior in PWS.

4) *Determine the diet and dietary shifts of humpback whales.* A shift in prey by whales can have profound effects on herring (i.e. in Southeast Alaska, when euphausiids become available pressure on herring by whales is greatly reduced).

5) *Estimate predation rates on herring by humpback whales.* This objective quantifies predation pressure on herring for PWS.

6) *Incorporate mortality rates into herring age structure models.* This is the management component of the study, to evaluate if predation by whales explains fluctuations in herring populations.

B. Changes to Project Design

We are continuing with a previous change, moving the February survey to late March/ early April

IV. SCHEDULE

A. Project Milestones for FY 16

For each project objective listed (III.A), specify when critical project tasks will be completed, as submitted in your original proposal. Please identify any substantive changes and the reason for the changes. Please format your information as in the following example:

Objectives

1) Population estimates of humpback whales through the use of photographic mark- recapture models. *To be met September 2015.*

2) Monitor the seasonal trends of humpback whales in Prince William Sound relative to prey. *To be met September 2015.*

3) Estimate inter-annual trends in humpback whale abundance. *To be met September 2015.*

4) Determine the diet and dietary shifts of humpback whales. *To be met September 2015.*

5) Estimate predation rates on herring by humpback whales. *To be met December 2015.*

6) Incorporate mortality rates into herring age structure models. *To be met January 2016.*

B. Measurable Project Tasks for FY 16

Humpback whale vessel survey schedule for Prince William Sound.

Month	FY12	FY13	FY 14	FY15	FY16
Oct	6 days	6 days	6 days	6 days	Synthesis
Dec	6 days	6 days	6 days	6 days	Synthesis
Apr	6 days	6 days	6 days	6 days	Synthesis
Total vessel days	**18**	**18**	**18**	**18**	**72**

Completed humpback whale surveys for Prince William Sound.

Month	FY12	FY13	FY 14	FY15	FY16
Sep-Oct	6 days	7 days	7 days	14 days	Synthesis
Nov-Dec	6 days	7 days	7 days	6 days	Synthesis
Feb	4 days	4 days	-	-	Synthesis
Mar-Apr	4 days	8 days	7 days	6 days	Synthesis
Jul	3 days	-	5 days	analysis	Synthesis
Total vessel days	**23**	**26**	**26**	**26**	**101**

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

Compile and analyze data.

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

Compile and analyze data. Begin writing final report.

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

Complete final report

FY 16, 4th quarter (November 1, 2016- January 31, 2017)

Submit final report. This will consist of a draft manuscript for publication to the Trustee Council.

V. PROJECT PERSONNEL – CHANGES AND UPDATES

There are no staffing changes

VI. BUDGET

A. Budget Forms (Attached)

Please see budget form provided separately

B. Changes from Original Proposal

There are no budget changes

C. **Sources of Additional Funding**

$25K of Moran's time from NMFS.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$2.0	$2.0	$2.0	$2.0	$0.0	$8.0	
Travel	$5.4	$5.4	$5.4	$5.4	$1.8	$23.4	
Contractual	$103.5	$104.8	$114.7	$116.5	$46.1	$485.6	
Commodities	$6.0	$6.0	$6.0	$6.0	$2.0	$26.0	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (*will vary by proposer*)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
SUBTOTAL	$116.9	$118.2	$128.1	$129.9	$49.9	$543.0	
General Administration (9% of subtotal)	$10.5	$10.6	$11.5	$11.7	$4.5	$48.9	
PROJECT TOTAL	$127.4	$128.8	$139.6	$141.6	$54.4	$591.9	
Other Resources (In kind Funds)	$83.5	$74.7	$75.0	$78.5	$25.0	$336.7	

COMMENTS: In-kind contribution from NOAA - $25K/year in salary for Moran. An addition $58.5K in FY12 , $49.7K in FY13, $50.0K in FY14,and $54.9K in FY15 of NOAA ship time was used to increase survey effort.

FY12-16

Program Title: 16120114-N Humpback Whale Monitoring
Team Leader: Moran/Straley

SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
			Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Jnu ANC AMSS	0.6	1	4	0.3	1.8
					0.0
				Travel Total	$1.8

FY16

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
PERSONNEL &
TRAVEL DETAIL

Contractual Costs:		Contract Sum
Description		
Straley (UAS)		18.4
Quinn (UAF)		20.0
Contract labor		7.7
If a component of the project will be performed under contract, the 4A and 4B forms are required.	**Contractual Total**	$46

Commodities Costs:	Commodities Sum
Description	
Shipping	2.0
Commodities Total	$2.0

FY16

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Descriptior	Number of Units	Inventory Agency

FY16

Program Title: Humpback Whale Monitoring
Team Leader: Moran/Straley
Agency: NOAA Fisheries/Auke Bay Labs

FORM 4B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Long-term monitoring: Pelagic monitoring component - Monitoring long-term changes in forage fish distribution, abundance, and body condition in Prince William Sound

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): John Piatt and Mayumi Arimitsu, U.S. Geological Survey, Alaska Science Center

Study Location: Prince William Sound

Project Website : http://alaska.usgs.gov/science/biology/seabirds_foragefish/

Abstract*:
This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al. In response to a lack of recovery of wildlife populations following the Exxon Valdez Oil Spill (EVOS), and evidence of natural background changes in forage fish abundance, there was a significant effort to document forage fish distribution, abundance, and variability in Prince William Sound (PWS) since the 1990's. We proposed to adopt some of these earlier sampling techniques, and also incorporate new methods to monitor forage fish in Prince William Sound with fishing and acoustic surveys of forage fish, and to measure indices of forage fish condition. In this last year of the project, we will not conduct field work. We will complete analysis of all data collected in FY12-15 and produce a final report on methods for long-term monitoring of forage fish distribution, abundance and condition in Prince William Sound.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$209.9	$202.5	$202.5	$202.5	$150.3	$967.6

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$339.0	$130.0	$130.0	$130.0	$110.0	$839.0

** Figures given in $1,000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

As originally proposed, the objectives of this work are to 1) identify robust indices for monitoring forage fish populations over time and devise a sampling strategy for long term monitoring of those indices, 2) assess the current distribution, abundance, species composition, and body condition of forage fishes (other than herring) in selected areas of Prince William Sound at selected times of the year, and 3) relate abundance and distribution of forage species to abiotic characteristics of the marine environment. We have made significant progress towards these goals, and completed the field work component of the project.

During past reporting periods we worked closely with the Herring Research and Monitoring Program Manager and an experienced spotter pilot to implement a survey design that increases encounter rate to sample target species. In 2015 we again worked in conjunction with juvenile herring aerial survey team by providing equipment and expertise for data collection, aerial survey validation, data management, and mapping. We successfully carried out field sampling and validation of aerial observations in Prince William Sound in July 2015, although results were not available at the time of this report.

II. COORDINATION AND COLLABORATION

A. Within an EVOSTC-Funded Program

We have undertaken several collaborative projects within the program:

1) Aerial-acoustic survey for forage fish, including juvenile herring, with Scott Pegau (PWSSC), HRM coordinator. We have been working closely with Dr. Pegau through the 2015 summer aerial surveys. We provided equipment and expertise in survey data collection and data management, including data recorders, software, mapping services, cameras and accessories.
2) In 2015 we worked with Herring Program leads Scott Pegau, Paul Hershberger (USGS), and Kristen Gorman (PWSSC) to collect age 1 herring for disease research. We also observed Pacific sand lance with possible disease symptoms. We sent these samples to Hershberger for disease testing.
3) Humpback whale prey study with Jan Straley (UAS) and John Moran (NOAA), GWA humpback whale PIs, and Mary Anne Bishop (PWSSC), GWA fall and winter seabird abundance PI. We devoted vessel time and personnel during cruises in July and September 2014 to facilitate a broader understanding of humpback whale, seabird foraging dynamics and forage fish availability in Prince William Sound. We shared research platforms and collaborated on survey techniques that benefited our collective program components and promoted greater integration of pelagic program components.
4) We are working with the Kathy Kuletz (USFWS), Robb Kaler (USFWS) and others in the pelagic seabird group conducting Sound-wide surveys to coordinate on data analysis and future overlap of our respective projects.

B. With Other EVOSTC-funded Projects

We are working with the Gulf of Alaska Integrated Ecosystem Research Program (GOAIERP) leads in their ongoing North Pacific Research Board funded synthesis efforts, particularly with respect to the role of embayments in the Gulf of Alaska (GOA). We anticipate that the data collected by the Gulf Watch Alaska forage fish component and historical APEX work in Cook Inlet will facilitate broad synthesis in conjunction with the GOAIERP effort. We will participate in a GOAIERP workshop in March 2016, which will investigate research questions related to mechanisms of exchange between embayments and offshore areas in the GOA, and connectivity between their respective communities.

C. With Trustee or Management Agencies

None at this time.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

Identify the primary objectives for your project for FY16 as submitted in your original proposal.

1) Identify robust indices for monitoring forage fish populations over time and devise a sampling strategy for long term measurement of those indices,

2) Assess the current distribution, abundance, species composition, and body condition of forage fishes (other than herring) in selected areas of Prince William Sound (PWS) at selected times of the year, and

3) Relate abundance and distribution of forage species to abiotic characteristics of the marine environment.

B. Changes to Project Design

We have made significant progress and are on track to achieve our goals. Based on findings during historical work on forage fish and our surveys in 2012-13, we modified the study design for the 2014-15 field seasons (detailed in a protocol changes for project 12120114 document, available on the AOOS ocean workspace). The changes we implemented in 2014-2015 improved our ability to meet the project objectives by modifying historical aerial survey methods to increase repeatability and facilitate greater certainty in species composition and school density, as well as simplify the data collection and processing effort. We sampled a subset of aerial survey areas with acoustic and net-capture methods, and we used a spotter plane to identify forage schools in near-surface (< 10-15 m) waters.

In FY16 we will focus our efforts on data analysis and writing. As originally planned, we do not have field work scheduled for 2016.

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. Identify robust indices for monitoring forage fish populations over time and devise asampling strategy for long term monitoring of those indices.
To be met by Jan 2017

Objective 2. Assess the current distribution, abundance, species composition, and body condition of forage fishes (other than herring) in selected areas of PWS and at selected times of year.
To be met by Jan 2017

Objective 3. Relate abundance and distribution of forage species to abiotic and biotic characteristics of the marine environment.
To be met by Jan 2017

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

Feb-Apr: *Update project outreach website, analyze and summarize data*
Mar: *2015 Annual Report*

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

June 30: *upload 2015 data to workspace, update metadata*

June - Jul: *analyze data, writing*

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)
Aug - Oct: *analyze data, writing*

FY 16, 4th quarter (November 1, 2016- January 31, 2017)
Nov: *PI meeting*
Jan 31: *Final report due*

V. PROJECT PERSONNEL – CHANGES AND UPDATES

No changes.

VI. BUDGET

A. Budget Forms (Attached)

We have provided budget forms to accompany this document, however, cumulative numbers were unavailable at this time. Our spending plan since the last required full budget review in Feb. 2015 is on track and we do not anticipate any changes.

B. Changes from Original Proposal

C. Our FY16 funding request does not differ from our original proposal.

D. Sources of Additional Funding

Please see budget form provided separately.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$123.1	$123.1	$123.1	$123.1	$119.8	$612.2	
Travel	$11.4	$10.5	$10.5	$10.5	$3.3	$46.2	
Contractual	$14.6	$28.9	$28.9	$28.9	$14.8	$115.9	
Commodities	$20.0	$20.0	$20.0	$20.0	$0.0	$80.0	
Equipment	$23.5	$3.3	$3.3	$3.3	$0.0	$33.4	
SUBTOTAL	$192.6	$185.7	$185.7	$185.7	$137.9	$887.7	
General Administration (9% of subtotal)	$17.3	$16.7	$16.7	$16.7	$12.4	$79.9	
PROJECT TOTAL	$209.9	$202.5	$202.5	$202.5	$150.3	$967.6	
Other Resources (in kind Funds)	$297.2	$297.2	$297.2	$297.2	$72.2	$1,260.8	

Over life of the project, USGS will make a substantial contribution of salary (360.8K) for PIs (0.5 FTE GS-11, 0.2 FTE GS-15), half of the vessel costs for annual cruises (80K), and in each year all the field equipment required including sampling nets (9K; purse seine, beach seine, modified herring trawl, zooplankton nets), oceanography equipment (90K; CTD with rosette and external sensors, thermosalinograph), SIMRAD split beam dual frequency hydroacoustic equipment (141K), and small boats (10.5K).

FY12-16

Program Title: 16120114-O Forage Fish
Team Leader: John Piatt / M. Armitsu

FORM 4A
TRUSTEE AGENCY
SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Piatt GS-15 (in kind)	LTM Forage Fish Project/Team Leader	2.0	0.0		0.0
Arimitsu GS-12 (in kind)	LTM Forage Fish Project/Project Leader	6.0	0.0		0.0
GS-9	LTM Forage Fish Project/ Fisheries Biologist	12.0	6057.0		72.7
GS-7	LTM Forage Fish Project/ Fisheries Biologist	10.2	4645.0		47.1
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	10702.0	0.0	
				Personnel Total	$119.8

Travel Costs:		Ticket	Round	Total	Daily	Travel
Description		Price	Trips	Days	Per Diem	Sum
PI-Meeting	Airfare, hotel, M$IE	1,077	1	5	175.0	2.0
CO-PI Meeting	Airfare, hotel, M$IE	477	1	5	175.0	1.4
						0.0
						0.0
						0.0
						0.0
					Travel Total	$3.3

FY16

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
Stable Isotope Analyses	14.3
Outreach	0.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$14.8

Commodities Costs:	Commodities
Description	Sum
Commodities Total	$0.0

FY16

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency
Research Vessel M/V Gyre (with mid-water trawl capability)	1	USGS
Nets (beach seine, trawl, zooplankton)	5	USGS
Oceanographic equipment (CTD, Rossette, Thermosalinograph)	1	USGS
BIOSONICS DT-4000 Hydroacoustic system	2	USGS
Small boats (Naiad RIB, Zodiac)	2	USGS

FY16

Program Title: LTM Pelagic Monitoring
Team Leader: John Piatt
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Project Title: Long-term monitoring: Environmental Drivers component - Long-term Monitoring of Oceanographic Conditions in the Alaska Coastal Current from Hydrographic Station GAK 1

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Thomas Weingartner, Principal Investigator, (907-474-7993; tjweingartner@alaska.edu. Seth Danielson, Co-PI, (907-474- 7834; sldanielson@alaska.edu) School of Fisheries and Ocean Science, University of Alaska, Fairbanks, AK 99775

Study Location: The fieldwork will be conducted at Station GAK1 at the mouth of Resurrection Bay. The station is at ~59° 51'N, 149° 28'W, and is located on the inner edge of the ACC midway between Prince William Sound and Cook Inlet in approximately 265 m water depth.

Project Website http://www.ims.uaf.edu/gak1/

Abstract*: This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al.

This program continues a 45-year time series of temperature and salinity measurements at hydrographic station GAK 1. The data set, which began in 1970, now consists of monthly CTDs and a mooring with 6 temperature/conductivity recorders throughout the water column. The project monitors two important Alaska Coastal Current ecosystem parameters that will quantify and help understand interannual and longer period variability in: a) Temperature and salinity throughout the 250 m deep water column, and b) Near surface stratification.

In aggregate these variables are basic descriptors of the Alaska Coastal Current, an important habitat and migratory corridor for organisms inhabiting the northern Gulf of Alaska, including Prince William Sound.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$109.5	$112.5	$115.7	$119.1	$122.5	$579.3

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

** Funds expressed in $1000 increments*

Date:

I. EXECUTIVE SUMMARY

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

The 45-year GAK 1 time series has documented:

1. The large interannual differences associated with El Nino and La Nina events, including substantial differences in the spring bloom between these phenomena (Weingartner et al., 2003, Childers et al., 2005).
2. The intimate connection between coastal freshwater discharge and the depth-varying evolution of winter and spring temperatures over the shelf (Janout et al., 2010; Janout 2009).
3. That GAK 1 is a reliable index of ACC transports of mass, heat, and freshwater (Weingartner et al., 2005).
4. That GAK 1 near-surface salinities are correlated with coastal freshwater discharge from around the Gulf (Weingartner et al., 2005).
5. Variations in mixed-layer depth in the northern Gulf, which affects primary production (Sakar et al., 2006)
6. Decadal scale trends in salinity and temperature, (Royer, 2005; Royer and Grosch, 2006; Weingartner et al., 2005, and Janout et al., 2010). including an increase in stratification due to surface freshening and increased salinization of deep (>100 m) shelf waters).
7. The relationships between temperature and salinity variations and the Pacific Decadal Oscillation and the strength and position of the Aleutian Low (Royer, 2005; Weingartner et al., 2005, and Janout et al., 2010)
8. That the record can guide understanding the variability in iron concentrations, a potentially limiting micro-nutrient required by many phytoplankton. Preliminary efforts indicate that iron and surface salinity are correlated at least in certain seasons (Wu, et al., 2008).

As shown by Meuter et al., (1994), Meuter (2004), and Spies (2009), these issues affect ecosystem processes on both the shelf and within Prince William Sound and Lower Cook Inlet/Kachemak Bay. Most recently our results have identified a long term increase in upper ocean stratification due to surface freshening and increased salinization of deep (>100 m) shelf waters). The surface freshening corresponds to an increase in coastal freshwater discharge and glacial melting. The subsurface salinization has yet to be explained. It may be because of a decrease in wind speeds (observed), increased surface freshening and thus inhibition of vertical mixing, or a change in the salinity of offshore waters that annually bathe the deeper portions of this shelf.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

This project is part of the EVOSTC funded Long-term Monitoring Program associated with the Environmental Drivers portion of Gulf Watch Alaska. We share data with all other projects within this portion of the Gulf Watch Program including the following: The Continuous Plankton Recorder, The Seward Line, Oceanographic Condition in Lower Cook Inlet, Oceanographic conditions in Prince William Sound. We share logistics at least twice per year with the Seward Line project. We provide data for the biologists examining phytoplankton and zooplankton distributions as part of the Seward Line and Continuous Plankton Recorder projects. We are examining the spatial and temporal coherence in temperature and salinity with the Cook Inlet and Prince William Sound projects. The latter effort is to determine the degree of spatial heterogeneity in these variables over the inner shelf of the Gulf of Alaska.

B. With Other EVOSTC-funded Projects

The GAK 1 project primarily provides data and interpretation to the Nearshore and Pelagic Ecosystem projects within the Gulf Watch program and to the EVOSTC-funded Herring Research and Monitoring Program. The primary value of the GAK1 data set is to provide the PIs of these other programs an appreciation of the longer-term variability of the Gulf of Alaska as they examine their data sets.

C. With Trustee or Management Agencies

Our data has been used in deliberations by the North pacific Fishery Management Council annually since 2009, see for example: Zador, S. (editor) and coauthors, 2013, North Pacific Fishery Management Council Ecosystem Considerations for 2014 for the North Pacific Groundfish Stock Assessment and Fishery Evaluation Report, Resource Ecology and Fisheries Management Division, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA, Seattle, WA.

Our main effort is devoted to posting the data as quickly as possible so that others may use it for their purposes. We do not track the data users, except to ask them if they are using the data, in which case we mention that on our project website. To date we have listed 36 papers that have used or cited these data on our website. Twenty-four of these publications address fisheries issues, while the remaining pertain largely to physical oceanographic variability on the Gulf of Alaska shelf and the North Pacific Ocean.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

Objectives

The fundamental goal of this program is to provide a high quality, long-term data to quantify and understand monthly, seasonal, interannual and longer period variability of the Gulf of Alaska shelf.

1. Temperature and salinity throughout the water column,
2. Near surface stratification since this affects phytoplankton bloom dynamics,

B. Changes to Project Design

There are no anticipated changes in the project design.

IV. SCHEDULE

A. Project Milestones for FY 16

For each project objective listed (III.A), specify when critical project tasks will be completed, as submitted in your original proposal. Please identify any substantive changes and the reason for the changes. Please format your information as in the following example:

Objective 1. Quasi-monthly CTDs will be updated quarterly and placed on the website and the moored measurements will be made available by March-April following the year that the mooring is recovered. This allows time for the instruments to be calibrated (at the manufacturer and the post-calibrations applied to the data set.

Objective 2. Determine seasonal changes in near surface stratification since this affects phytoplankton bloom dynamics. Updated annually in accordance with the processing of the mooring data.

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

February, 2014 Project funding available

Begin quasi-monthly CTD sampling at GAK1; recover and re-deploy the GAK 1 mooring

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

Continue quasi-monthly CTD sampling at GAK1*;*

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

Continue quasi-monthly CTD sampling at GAK1*;* Post data on website and Gulf Watch Data Portal (via AOOS)

FY 16, 4th quarter (November 1, 2016- January 31, 2017)

Continue quasi-monthly CTD sampling at GAK1*;* Post data on website and Gulf Watch Data Portal (via AOOS); prepare annual report.

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Dr. Seth Danielson will be the Co-PI in year 5 and he will be leading this project in the future. His CV follows.

CV OF SETH LOMBARD DANIELSON

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School of Fisheries and Ocean Sciences
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Professional Preparation

University of Alaska Fairbanks, Ph.D. Oceanography, 2012
University of Alaska Fairbanks; M.S. Oceanography, 1996
Lehigh University; B.S. Electrical Engineering, 1990, with honors

Appointments

Research Assistant Professor of Oceanography, IMS-UAF, Fairbanks, AK, 2013-present
Research Professional, IMS-UAF, UAF, Fairbanks, AK, 1997–2013
Driller, Polar Ice Coring Office, IMS-UAF, Fairbanks AK, 1993-1994 and UNL, Lincoln, NB, 1996-1997
Research Assistant, Institute of Marine Science, UAF, Fairbanks, AK, 1994-1996
Junior Engineer, Allen Organ Company, Macungie, PA, 1990-1992

Memberships

American Geophysical Union
The Oceanography Society

Select Peer-Reviewed Publications

Danielson. S. L., L. Eisner, C. Ladd, C. Mordy, L. de Sousa, and T. J. Weingartner (submitted), A comparison

between late summer 2012 and 2013 water masses, macronutrients, and phytoplankton standing crops in the northern Bering and Chukchi Seas, Arctic Eis DSR-II Special Issue

Danielson, S. L., T. W. Weingartner, K. Hedstrom, K. Aagaard, R. Woodgate, E. Curchitser, and P. Stabeno, (2014), Coupled wind-forced controls of the Bering–Chukchi shelf circulation and the Bering Strait through-flow: Ekman transport, continental shelf waves, and variations of the Pacific–Arctic sea surface height gradient. Prog. Oceanogr. http://dx.doi.org/ 10.1016/j.pocean.2014.04.006

Danielson, S.L., E. N. Curchitser, K. Hedstrom, T. J. Weingartner, and P. Stabeno (2011) On ocean and sea ice modes of variability in the Bering Sea, *J. Geophys. Res.*, doi:10.1029/2011JC007389

Janout, M.A., T.J. Weingartner, T. C. Royer, **S. L. Danielson** (2010), On the nature of winter cooling and the recent temperature shift on the northern Gulf of Alaska shelf, JGR Oceans, 2009JC005774R, DOI: 10.1029/2009JC005774

Weingartner, T.J., **S.L. Danielson**, T.C. Royer (2005), Fresh Water Variability in the Gulf of Alaska: Seasonal, Interannual and Decadal Variability, Deep-Sea Res. II, 52 (1-2): 169-191

Okkonen, S.R., T.J. Weingartner, **S.L. Danielson**, D. L. Musgrave and G. M. Schmidt (2003), Satellite and Hydrographic Observations of Eddy-Induced Shelf-Slope Exchange in the Northwestern Gulf of Alaska, JGR Oceans, 108 (C2): Art. No. 3033

Synergistic Activities

Participant and presenter at the Pribilof Island *Bering Sea Days* week of ocean exploration for St. Paul Island and St. George Island students and community members 2011-present.

Participant and presenter in the October 2010 BEST/BSIERP Professional Development Workshop in Anchorage, AK and the October 2009 Center for Ocean Science Education Excellence (COSEE) "Salmon in the Classroom" teacher workshops in Fairbanks AK.

Reviewer on the November 2008 technical final design review (FDR) panel for the NSF-funded Ocean Observatories Initiative (OOI) and in 2010 for the OOI program's awardee (WHOI) during the RFP phase in selecting manufacturers for the buoy power system.

Reviewer for peer reviewed journal articles in: *Geophysical Research Letters*, *Journal of Geophysical Research*, *Continental Shelf Research*, *Deep-Sea Research*, *Climate Dynamics*

Reviewer for peer-reviewed proposals submitted for funding to EPSCOR, NOAA, NSF, NPRB

Creator of numerous outreach-directed marine science web pages, including:

- Retrospective analysis of Norton Sound benthic communities (www.ims.uaf.edu/NS/)
- GAK1 long-term oceanographic monitoring time series (www.ims.uaf.edu/gak1/)
- GLOBEC NEP monitoring program (www.ims.uaf.edu/GLOBEC/)
- Real-time data and plot delivery webpage for community-based satellite-tracked drifter projects in the Bering and Chukchi Seas (www.ims.uaf.edu/drifters/)

Committee Appointments

2007 SFOS search committee for Marine Superintendent at the Seward Marine Center

2004 UAF search committee for SFOS Dean

Thesis Titles

Variability in the circulation, temperature, and salinity fields of the eastern Bering Sea shelf in response to atmospheric forcing, 2012 Ph.D. Thesis

Chukchi Sea Tidal Currents: Model and Observations, 1996 Masters Thesis.

Collaborators

K. Aagaard, (University of Washington); C. Carothers (University of Alaska Fairbanks); E. Curchitser (Rutgers University); L. De Sousa, (North Slope Borough); G. Eckert (University of Alaska Fairbanks); L. Eisner (National Oceanic and Atmospheric Administration); K. Coyle (University of Alaska Fairbanks); K. Hedstrom (University of Alaska Fairbanks); C. Harui (University of Alaska Fairbanks); R. Hopcroft (University of Alaska Fairbanks); K. Iken, (University of Alaska Fairbanks); M. Janout (Alfred Wegener Institute for Polar and Marine Research), S. Jewett (University of Alaska Fairbanks); Z. Kowalik (University of Alaska Fairbanks); J. Mathis (NOAA-PMEL); A. McDonnell, (University of Alaska Fairbanks); B. Moynahan (National Park Service); F. Mueter, (University of Alaska Fairbanks); B. Norcross (University of Alaska Fairbanks); A. Pinchuk (University of Alaska Fairbanks); T. Royer (ret.); P. Stabeno (National Oceanic and Atmospheric Administration); T. Weingartner (University of Alaska Fairbanks); W. Williams (Institute of Ocean Science, Fisheries and Oceans

Canada); P. Winsor, (University of Alaska Fairbanks); T. Whitledge (University of Alaska Fairbanks); R. Woodgate (University of Washington); J. Zhang (University of Washington).

Related Activities

1997-2004: Global Ocean Ecosystem Dynamics (GLOBEC) program in the Gulf of Alaska (NSF)
1997-present: Monitoring at oceanographic station GAK1 in the Gulf of Alaska (NSF/EVOS/NPRB)
2002-2004: Shelf-Basin Interaction (SBI) program in the Chukchi-Beaufort seas (NSF)
2008-2014: Bering Sea Ecosystem Study (BEST) moorings and larval transport modeling (NSF)
2008-present: Chukchi Sea Environmental Studies Program (CSESP, Shell/Conoco Phillips/Statoil)
2009-present: External advisor and analyst for Glacier Bay National Park and Preserve oceanographic monitoring and associated process studies (NPS)
2010-2013: co-PI, Adaptation of an Arctic Circulation Model (BOEM)
2012-present: co-PI, Arctic Ecosystem Integrated Survey (Arctic Eis, BOEM)
2013-present: PI, Bering-Chukchi transport pathways (NPRB)
2014-present: PI, Ecosystem monitoring and detection of wind and ice-mediated changes through a year-round physical and biogeochemical mooring in the Northeast Chukchi Sea (NPRB, AOOS, Olgoonik-Fairweather, UAF)
2014-present: co-PI Measuring the pulse of the Gulf of Alaska: Oceanographic observations along the Seward Line (NPRB)
2015-present: co-PI, Arctic Marine Biodiversity Observing Network (AMBON; NOPP/Shell)

VI. BUDGET

A. Budget Forms (Attached)

Provide completed budget forms.

B. Changes from Original Proposal

No substantive changes.

C. Sources of Additional Funding

With the arrival of the R/V Sikuliaq in Seward Alaska, we may be able to use this vessel for opportunistic CTD sampling at station GAK 1. It is not possible to determine at this point in time what the vessel's schedule is and if it will be in a position to enhance the monthly CTD sampling effort.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$52.7	$55.1	$57.5	$60.1	$62.8	$288.2	
Travel	$1.4	$1.5	$1.5	$1.6	$1.7	$7.8	
Contractual	$22.9	$22.9	$22.9	$22.9	$22.9	$114.6	
Commodities	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Equipment	$10.0	$10.0	$10.0	$10.0	$10.0	$50.1	
Indirect Costs (will vary by proposer)	$13.4	$13.8	$14.2	$14.5	$14.9	$70.8	
SUBTOTAL	$100.5	$103.2	$106.2	$109.2	$112.4	$531.5	
General Administration (9% of subtotal)	$9.0	$9.3	$9.6	$9.8	$10.1	$47.8	
PROJECT TOTAL	$109.5	$112.5	$115.7	$119.1	$122.5	$579.3	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	

COMMENTS: *The General Administration line item is distributed to the management agency and is not part of the project's annual fiscal reporting. Actual expeditures are those through July 31, 2013

FY12-16	**Program Title: 16120114-P GAK1** **Team Leader: T. Weingartner**	**FORM 3A** **NON-TRUSTEE AGENCY SUMMARY**

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
T. Weingartner	PI	0.5	15.056		7.528
Technician 1		2.0	12.580	15.161	40.321
Technician 2		1.0	14.981		14.981
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	42.6	15.2	
				Personnel Total	$62.8

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Fairbanks to Seward (for cruise)	0.512	1	4	0.303	1.724
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.7

FY16	**Program Title: GAK Component** **Team Leader: T. Weingartner**	**FORM 3B** **PERSONNEL & TRAVEL DETAIL**

Contractual Costs:	Contract
Description	Sum
vessel charter for CTDs (8 1-day trips, $1500/day)	12.000
vessel charter for morrings (1 2-day trip, $2000/day)	4.000
MicroCat and SeaCat calibrations (6 @ $600, 1 @ $1000)	4.600
SEBE-25 calibration	1.520
shipping	0.800
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$22.9

Commodities Costs:	Commodities
Description	Sum
Project Supplies	0.0
Commodities Total	$0.0

FY16	**Program Title: GAK Component** **Team Leader: T. Weingartner**	**FORM 3B** **CONTRACTUAL & COMMODITIES DETAIL**

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
Seabird 37SMP Microcat with pressure	1.0	4.565	4.565
miscellaneous mooring hardware	1.0	5.450	5.450
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$10.0

Existing Equipment Usage: Descriptic	Number of Units	Inventory Agency

FY16	**Program Title: GAK Component** **Team Leader: T. Weingartner**

FORM 3B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Gulf Watch Alaska: Nearshore Systems in the Gulf of Alaska

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): H. Coletti, National Park Service; B. Ballachey, J. Bodkin, D. Esler, K. Kloecker, D. Monson, B. Weitzman, US Geological Survey; T. Dean, Coastal Resource Associates; M. Lindeberg, NOAA; A. Doroff, Kachemak Bay Research Reserve.

Study Location: Gulf of Alaska: Prince William Sound, Kenai Fjords National Park, Katmai National Park and Preserve

Project Website: http://www.gulfwatchalaska.org
http://science.nature.nps.gov/im/units/swan/monitor/nearshore.cfm
http://alaska.usgs.gov/science/biology/nearshore_marine/lt_monitoring.php

Abstract*: This project is a component of Gulf Watch Alaska: Integrated Long-Term Monitoring of Marine Conditions and Injured Resources and Services. For the Nearshore ecosystem component, we have implemented a long-term monitoring program at five locations across the GOA, including sampling areas in Western, Northern and Eastern Prince William Sound (PWS), Kenai Fjords National Park, and Katmai National Park and Preserve. Additional nearshore sampling as part of Gulf Watch Alaska is ongoing in Kachemak Bay (Project 12120114-L) and is closely coordinated with this project. The Gulf Watch Alaska nearshore program is integrated with nearshore monitoring implemented in 2006 by the National Park Service to cost-effectively monitor nearshore ecosystems across the central and western Gulf of Alaska, including spill-affected areas, and provide information on recovery and restoration of injured resources. We propose to (1) continue sampling Katmai NPP, Kenai Fjords NP, and Western PWS in 2016 (all 3 areas previously sampled in multiple years starting in 2006), and (2) sample Eastern PWS in 2016 (previously sampled in 2012 and 2014). We will continue to coordinate with the ongoing nearshore monitoring program in Kachemak Bay. Monitoring metrics include marine invertebrates, kelps, sea grasses, birds, mammals, and physical parameters. In addition to taxa-specific metrics, monitoring includes recognized important ecological relations that include predator-prey dynamics, measures of nearshore ecosystem productivity, and contamination. The nearshore benthic monitoring program also will integrate physical data collected in PWS, along the GOA shelf and in Cook Inlet, under the Environmental Drivers component of the GWA long-term monitoring program.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA*):

FY12	FY13	FY14	FY15	FY16	TOTAL
$282.4	$304.1	$331.9	$309.6	$331.9	$1,559.9

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$274.0	$274.0	$274.0	$274.0	$392.0	$1,488.0

** Figures given in $1,000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

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

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

Further, the nearshore is sensitive to natural and human disturbances on a variety of temporal and spatial scales. Nearshore systems are especially good indicators of change because organisms in the nearshore are relatively sedentary, accessible, and manipulable, and builds on a growing understanding of mechanistic links between nearshore species and their physical environment that facilitates understanding causes of change.

With respect to the goals of the Gulf Watch Alaska (GWA) long-term monitoring program, the nearshore is the habitat where we may detect relatively localized sources of change, distinguish human-induced from natural changes, and provide suggestions for policies to reduce human impacts. Because many organisms in the nearshore are sessile or have limited home ranges, they can be linked to sources of change. Finally, the nearshore is critically important because it was the habitat most impacted by the 1989 EVOS, and has been a repository for lingering oil linked to protracted injury to resident species.

In 2006, a restoration and ecosystem monitoring plan for the nearshore marine ecosystems in the GOA was completed (EVOSTC Project 050750). The framework for monitoring in the nearshore included sampling of a variety of specified biological and physical parameters (e.g., abundance and growth of intertidal organisms, abundance of selected birds and marine mammals) within specified areas across the GOA. The plan also allowed for conduct of shorter-term studies aimed at identifying important processes regulating or causing changes within a given system. The plan was adopted by the National Park Service Southwest Alaska Network and implemented in Katmai NPP (2006) and in Kenai Fjords NP (2007). In 2010, the EVOSTC funded the long-term nearshore monitoring program in western PWS (Project 10100750). In 2012, the GWA project was initiated to continue and expand the long-term nearshore monitoring, in combination with studies of pelagic systems and environmental drivers. As part of the GWA effort, nearshore monitoring is ongoing in Eastern, Northern and Western PWS, and at Katmai and Kenai Fjords national parks (including 5 sites within each area). Here, we propose to continue the long-term nearshore monitoring program across the GOA in 2015 and 2016.

The list of metrics and projected schedule for monitoring within the nearshore benthic component are outlined in Table 1. Standard operating procedures (SOP's) for all data collection have been fully developed as part of the preparation and implementation of nearshore monitoring in Katmai NP, Kenai Fjords NP, and Western PWS. A protocol narrative (Dean et al. 2014) describes the overall monitoring program, and a series of specific SOP's provide details of each data collection procedure, their relations to one another, and how they can be integrated to provide understanding of causes of change that will be detected. SOP's can be found on the GWA website.

Data analyses and statistical methods used to evaluate changes in the nearshore environment are detailed in Dean et al. (2014). In general, we will examine trends in each metric over time within each location, evaluate similarities among locations over time, and interactions between time and locations (i.e., the extent to which changes within each location track changes across locations over time).

Citation: Dean, T.A., Bodkin, J.L., and Coletti, H.A. 2014. Protocol narrative for marine nearshore ecosystem monitoring in the Gulf of Alaska: Version 1.1. Natural Resource Report NPS/SWAN/NRR—2014/756. National Park Service, Fort Collins, Colorado.

New publications (since Year 4 proposal submission):

Ballachey, B.E. and J.L. Bodkin. 2015. Challenges to sea otter recovery and conservation. Chapter 4 in: Larson, S.E., Bodkin, J.L. and VanBlaricom, G.B., eds. Sea Otter Conservation. Academic Press.

Ballachey, B., J. Bodkin , H. Coletti , T. Dean, D. Esler G. Esslinger, K. Iken, K. Kloecker, B. Konar, M. Lindeberg, D. Monson, M. Shephard, and B. Weitzman. 2015. Variability within Nearshore Ecosystems of the Gulf of Alaska. *In:* Science Synthesis Report for the Gulf Watch Alaska Program. December 2014.

Ballachey, B.E., J.L. Bodkin, K.A. Kloecker, T.A. Dean, and H.A. Coletti. 2014. Monitoring for Evaluation of Recovery and Restoration of Injured Nearshore Resources. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 10100750), U.S. Geological Survey, Alaska Science Center, Anchorage, Alaska.

Bodkin, J.L. 2015. Historic and contemporary status of sea otters in the North Pacific. Chapter 3 in: Larson, S.E., Bodkin, J.L. and VanBlaricom, G.B., eds. Sea Otter Conservation. Academic Press.

Bowen, L., A.K. Miles, B.E. Ballachey, and J.L. Bodkin. 2015. Gulf Watch Alaska Long-term Monitoring Program - Evaluating Chronic Exposure of Harlequin Ducks and Sea Otters to Lingering *Exxon Valdez* Oil in Western Prince William Sound: Gene Transcript Profiles in Sea Otters from Prince William Sound, Alaska. *Exxon Valdez* Oil Spill Trustee Council Restoration Project Final Report (Project 12120114-Q), U.S. Geological Survey, Alaska Science Center, Anchorage, Alaska. *(In review at EVOSTC)*

Coletti, H. A. and T. L. Wilson. 2015. Nearshore marine bird surveys: data synthesis, analysis and recommendations for sampling frequency and intensity to detect population trends. *In:* Science Synthesis Report for the Gulf Watch Alaska Program. December 2014.

Esler, D., and B.E. Ballachey. 2014. Long-term Monitoring Program - Evaluating Chronic Exposure of Harlequin Ducks and Sea Otters to Lingering *Exxon Valdez* Oil in Western Prince William Sound. *Exxon Valdez* Oil Spill Trustee Council Restoration Project Final Report (Project 14120114-Q), U.S. Geological Survey, Alaska Science Center, Anchorage, Alaska.

Esslinger, G. G., J. L. Bodkin, A. R. Breton, J. M. Burns, and D. H. Monson. 2014. Temporal patterns in the foraging behavior of sea otters in Alaska. Journal of Wildlife Management 78(4):689-700. doi:10.1002/jwmg.701

Konar, B., K. Iken, H. A. Coletti,T. A. Dean, and D. H. Monson. 2015. Research Summary: Influence of static habitat attributes on local and regional biological variability in rocky intertidal communities of the northern Gulf of Alaska. *In:* Science Synthesis Report for the Gulf Watch Alaska Program. December 2014.

Monson, D.H. and L. Bowen. 2015. Evaluating the status of individuals and populations: Advantages of multiple approaches and time scales. Chapter 6 in: Larson, S.E., Bodkin, J.L. and VanBlaricom, G.B., eds. Sea Otter Conservation. Academic Press.

Monson D. H., T. A. Dean, M. R. Lindeberg, J. L. Bodkin, H. A. Coletti, D. Esler, K. A. Kloecker, B. P. Weitzman and B. E. Ballachey. 2015. Inter-annual and spatial variation in Pacific blue mussels (*Mytilus trossulus*) in the Gulf of Alaska, 2006-2013. *In:* Science Synthesis Report for the Gulf Watch Alaska Program. December 2014.

Poster presentations (since August 2015 annual report):

Holderied, K., M. McCammon, K. Hoffman, T. Neher, T. Weingartner, R. Hopcroft, M. Lindeberg, and B. Ballachey. 2015. Gulf Watch Alaska: Monitoring the Pulse of the Gulf of Alaska's Changing Ecosystems. Alaska Marine Science Symposium. January 2015. Anchorage, AK.

Konar, B., K. Iken, H. A. Coletti, T. A. Dean, and D. H. Monson. 2015. Static habitat attributes influence biological variability in intertidal communities in the central Gulf of Alaska. Alaska Marine Science Symposium. January 2015. Anchorage, AK.

Monson D. H., T. A. Dean, M. R. Lindeberg, J. L. Bodkin, H. A. Coletti, D. Esler, K. A. Kloecker, B. P. Weitzman and B. E. Ballachey. 2015. Inter-annual and spatial variation in Pacific blue mussels (*Mytilus trossulus*) in the Gulf of Alaska, 2006-2013. Alaska Marine Science Symposium. January 2015. Anchorage, AK.

Outreach activities (since August 2015 annual report):

Coletti, H. (NPS). January 2015. National Park Service Participates in on-line Gulf Watch Alaska curriculum in an outreach partnership effort with the Alaska SeaLife Center (ASLC).

Coletti, H. (NPS). April 2015. Overview of SWAN and GWA to interpretive rangers at Kenai Fjords National Park.

Esler, D. (USGS). January 2015. USGS Alaska Science Center Participates in on-line Gulf Watch Alaska curriculum in an outreach partnership effort with the Alaska SeaLife Center (ASLC).

Esler, D. (USGS). 2015-2016. Delta Sound Connections Article - Tidewater Trends in Nearshore Ecosystems.

Jones, R. (NPS). July 2015. NPS Interpretive Ranger Provides Educational Outreach about NPS SWAN and the Alaska Gulf Watch Program during a Discovery Lab event held at the Alaska Islands & Ocean Visitor Center in Homer, Alaska.

Kloecker, K. (USGS). November 2015. USGS Scientists Participated in STEM Activities for Middle School Students.

Kloecker, K. (USGS). November 2015. USGS Scientists Participated in STEM Activities for Elementary School Students.

Kloecker, K. (USGS). July 2015. USGS Scientist Provides Educational Outreach about the Alaska Gulf Watch Program—26 Years of Ocean Monitoring during a Discovery Lab event held at the Alaska Islands & Ocean Visitor Center in Homer, Alaska.

Kunisch, E. and H. Coletti (NPS). Spring 2015. DOI Newswave Article – Monitoring for Sea Star Wasting Disease in the Northern Gulf of Alaska.

Monson, D. (USGS). October 2014. USGS, USFWS, APU and UAA Partner with OLÉ! To Teach Marine Mammals of Alaska Class.

Numerous Facebook posts about GWA on Katmai NPP and Kenai Fjords NP Facebook pages

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

It is important to recognize that the Nearshore component of Gulf Watch is designed as a highly integrated and coordinated set of metrics, which are measured consistently across broad geographic scales and over a long time frame. The Nearshore group consists of a large number of scientists working together within a coordinated monitoring system that allows unprecedented insights into nearshore ecosystem status and ecological interactions. Although each metric could have been considered as a separate project, the Nearshore component operates as a single, synchronized program, leading to insights and efficiencies that could not be attained otherwise.

We are coordinating closely with the other project within the Nearshore Benthic component of the GWA program, 12120114-L (K. Iken and B. Konar, PIs), which is monitoring nearshore areas within Kachemak Bay. Coordination includes shared protocols for monitoring and data collection, pooling of data sets and a united effort on data analyses and syntheses.

As productivity in the nearshore is strongly influenced by physical oceanographic processes, it is a priority to evaluate whether or not changes noted in nearshore systems are reflected in either oceanographic conditions or in synchronous changes in pelagic species and conditions. To this end, we currently are coordinating with the Environmental Drivers component of the GWA project on data sets that may be relevant to our synthesis and analysis of biological metrics measured at our nearshore sites across the GOA.

In light of the harmful algal bloom observed this summer in the north Pacific, the Nearshore component collaborated with K. Holdried and A. Doroff of the GWA Environmental Drivers component to collect plankton samples at 5 Katmai nearshore sites (2 samples per site, “onshore” and “offshore”).

B. With Other EVOSTC-funded Projects

In July 2014, during our field work at Katmai NPP, we collected oil samples (asphalt and mousse) from three locations within the park, in cooperation with Gail Irvine of the USGS, who has conducted a long-term study of persistence and degradation of oil from the EVOS (most recently as EVOSTC Project 11100112, *Lingering Oil on Boulder-Armored Beaches in the Gulf of Alaska 22 Years after the Exxon Valdez Oil Spill*). These samples have been submitted for laboratory analyses of the oil components. As of summer 2015, all samples have been analyzed and discussions of preliminary results are on-going. Additional analyses include examining asphalt and mousse separately to assess differing weathering patterns. These analyses were funded outside of Project 11100112, but build on the historical datasets.

C. With Trustee or Management Agencies

Our work is contributing to the mission of the US Fish and Wildlife Service, who is the agency charged with management of migratory birds and some marine mammals, including sea otters. We also contribute to the management mission of NOAA, who is responsible for fisheries management. Our work also contributes to management of National Parks, including direct involvement in the nationwide inventory and monitoring program. Our information also may be informative to other land management agencies (e.g., US Forest Service) with units adjacent to our monitoring sites. We also engage scientists from a number of academic and private institutions as Nearshore component collaborators.

We are collaborating with NPS on their Changing Tides project, initiated in 2015 (http://www.nps.gov/articles/changing-tides.htm). During the GWA annual nearshore monitoring trip along the Katmai coast in July 2015, a variety of bivalves were collected, including samples of several species known to be consumed by bears that forage in intertidal areas. Species collected include the Pacific blue or bay mussel (*Mytilus trossulus*), the Pacific razor clam (*Siliqua patula*), the butter clam (*Saxidomus gigantea*), and *Mya* and *Macoma* clams. Clams and mussels were kept alive in small aquarium-like containers and transported to the Alaska SeaLife Center to be measured for information such as length, width, total weight, shell weight, and shell thickness, as well as feeding rates and caloric content. Additional clams and mussels were dissected in the field to obtain gill and mantle tissues, which were preserved. These tissue samples will be analyzed by USGS to measure expression of a selected set of genes indicative of health of individual bivalves and response to a variety of environmental stressors (e.g., elevated temperatures, ocean acidification, pollutants, and pathogens). Overall, the multiple measurements obtained on the clams and mussels will allow us to compare the health of bivalve populations at different sites, assess their responses and sensitivity to environmental stressors, and quantify their energetic value as bear prey.

The GWA Nearshore component continues to collaborate with USGS, SWAN and Kenai Fjords NP on a USGS-led cooperative project funded via a NRPP proposal that enhances our understanding of GWA sea otter foraging observations, and threats to sea otters and the broader nearshore community in that region.

Water samples were collected in 2014 in KATM and in 2015 in KEFJ to send to Woods Hole Oceanographic Institute to measure levels of radiation in sea water. Results for KATM indicate levels are below detection; results from KEFJ are pending. (http://ourradioactiveocean.org/)

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

The fundamental objective of this work is the long-term monitoring of a suite of nearshore benthic species at multiple locations across the Gulf of Alaska, with an overall goal of identifying important processes regulating or causing changes within a given nearshore ecosystem. The specific objectives for the period 2012-2016 include:

1. Continue restoration monitoring in the nearshore to evaluate the current status of injured resources in oiled areas.

2. Identify if those injured resources being monitored may be considered recovered from EVOS effects.

3. Identify potential factors that could inhibit recovery of injured resources, and recommend potential restoration actions.

B. Changes to Project Design

There have been no significant changes in design from that described in the original proposal. The monitoring and research generally is proceeding as initially planned. An exception is the aerial surveys of sea otter abundance, planned for Kenai Fjords NP in summer of 2013 and in Katmai NPP in summer 2014. In both cases, we were prepared and ready to conduct the surveys but at the last minute, the pilot designated to fly the surveys changed plans and was not available. We have made adjustments to correct this problem and conducted a survey at Katmai NPP in summer 2015. Kenai Fjords NP is scheduled for a sea otter survey in summer 2016, and WPWS will not be surveyed in 2016.

IV. SCHEDULE

A. Project Milestones for FY 16 (See Table 1)

Objective 1. Continue restoration monitoring in the nearshore to evaluate the current status of injured resources in oiled areas.
To be met by September 2016

Objective 2. Identify if those injured resources being monitored may be considered recovered from EVOS effects.
To be met by December 2016 (Note: This objective has been addressed in a recent report to the EVOSTC, Ballachey et al. 2014; see publication list above).

Objective 3. Identify potential factors that could inhibit recovery of injured resources, and recommend potential restoration actions.
To be met by December 2016 (Note: This objective has been addressed in a recent report to the EVOSTC, Ballachey et al. 2014; see publication list above).

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)
April: *Sea otter carcass collections, WPWS*

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)
June/July: *Nearshore sampling trips, Kenai, Katmai, WPWS, EPWS*

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)
August/October: *Data entry, verification, and analysis; report writing*

FY 16, 4th quarter (November 1, 2016- January 31, 2017)
November/January *Data analysis and report writing*
January *AMSS, Anchorage*

V. PROJECT PERSONNEL – CHANGES AND UPDATES

n/a

VI. BUDGET

A. Budget Forms (Attached)

B. Changes from Original Proposal

There are no significant changes in design from the original proposal.

C. Sources of Additional Funding

We have estimated the annual in-kind contributions to this project at $392,000. This consists of staff time from the USGS (Esler, Kloecker, Esslinger, Gyre Captain; $92K), reduced costs for USGS charter vessel ($45K), and significant use of equipment including inflatables/outboards, GPSs, spotting scopes, field laptops, field gear, and sounding equipment for eelgrass sampling ($45K, commodities and equipment). From NOAA, staff time & gear contributions (Lindeberg) are estimated at $10K. From NPS, staff time (Coletti and Shepherd [data manager]) is estimated at $130K; commodities, equipment use and travel costs are valued at $50.0K, and contract costs (Katmai vessel charter) at $20K.

Table 1. Components of the proposed nearshore benthic monitoring plan and schedule accomplished in 2015 and planned for 2016. (*Note*: 5 sites are sampled within each area).

COMPONENT	2015	2016
Western PWS, intertidal invertebrates and algae	x	x
Western PWS, kelps and sea grass	x	x
Western PWS, black oystercatchers	x	x
Western PWS, sea otter carcass recovery	x	x
Western PWS, sea otter foraging observations	x	x
Eastern PWS, intertidal invertebrates and algae		x
Eastern PWS, kelps and sea grass		x
Northern PWS, intertidal invertebrates and algae	x	
Northern PWS, kelps and sea grass	x	
Katmai NP, intertidal invertebrates and algae	x	x
Katmai NP, kelps and sea grass	x	x
Katmai NP, black oystercatchers	x	x
Katmai NP, sea otter carcass recovery	x	x
Katmai NP, sea otter foraging observations	x	x
Kenai Fjords NP, intertidal invertebrates and algae	x	x
Kenai Fjords NP, kelps and sea grass	x	x
Kenai Fjords NP, black oystercatchers	x	x
Kenai Fjords NP, sea otter carcass recovery	x	x
Kenai Fjords NP, sea otter foraging observations	x	x
Western PWS, sea otter aerial survey		
Kenai NP, sea otter aerial survey		x
Katmai NP, sea otter aerial survey	x	
PWS, nearshore summer marine bird survey (under Pelagic component)		x
Katmai NP, nearshore marine bird survey	x	x
Kenai NP, nearshore marine bird survey	x	x
Stable isotope analysis of selected nearshore species	x	x

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$110.0	$160.0	$160.0	$160.0	$160.0	$750.0	
Travel	$3.5	$5.0	$5.0	$5.0	$5.0	$23.5	
Contractual	$118.5	$103.0	$125.0	$103.0	$125.0	$574.5	
Commodities	$5.1	$9.0	$9.0	$9.0	$9.0	$41.1	
Equipment	$22.0	$2.0	$5.5	$7.0	$5.5	$42.0	
Indirect Costs (will vary by proposer)							
SUBTOTAL	$259.1	$279.0	$304.5	$284.0	$304.5	$1,431.1	
General Administration (9% of subtotal)	$23.3	$25.1	$27.4	$25.6	$27.4	$128.8	
PROJECT TOTAL	$282.4	$304.1	$331.9	$309.6	$331.9	$1,559.90	
All amounts are in thousands of dollars.							
Other Resources (in kind Funds)	$274.0	$274.0	$274.0	$274.0	$274.0	$1,370.0	

COMMENTS: Annual in-kind contributions from USGS consist of staff time (Esler, Bodkin, Kloecker, Esslinger, Snedgen: $60K), reduced charter costs ($24K), use of equipment such as inflatables/outboards, GPSs, spotting scopes, field laptops, sounding equipment (eelgrass sampling), 10K. From NOAA: staff time & expenses (Lindeberg), 10K; from NPS: staff time (Coletti, Shephard, others), 120K, operations, 50K.

FY12-16

Program Title: 16120114-R Nearshore Monitoring

Team Leader: Ballachey & Dean

FORM 4A
TRUSTEE AGENCY
SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Senior scientist, Ballachey		2.0	10.0		20.0
Field Leader: Daniel Monson		12.0	7.5		90.0
Biotech		8.0	5.0		40.0
NOAA staff		1.0	10.0		10.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	32.5	0.0	
				Personnel Total	$160.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Field travel					3.0
AMSS & LTM PI meeting	1.0	2			2.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.0

FY16

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
PERSONNEL &
TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
Vessel charter: PWS, $1.0/day * 23 days	23.0
Vessel charter: Katmai	20.0
Aerial Survey (sea otters) in Katmai/Kenai (alternating years)	17.5
Sea otter carcass tooth cementum age analysis	0.5
Stable Isotope analyses, PWS mussels	6.0
Coastal Resource Associates (CRA, Dr. Tom Dean)	36.0
Aerial Survey (sea otters) in PWS	22.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$125.0

Commodities Costs:	Commodities
Description	Sum
fuel for skiffs	3.0
field & safety gear	3.0
software	3.0
Commodities Total	$9.0

FY16

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
data logging instruments (HOBOs, Star-Oddis, etc)	1.0	2.0	2.0
field computers (toughbooks or equivalent)	1.0	3.5	3.5
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$5.5

Existing Equipment Usage: Description	Number of Units	Inventory Agency
Questar spotting scopes & high-power binocs for sea otter forage data collection	3	USGS
Existing small skiffs for charters (3 skiffs/nearshore trip are needed, more if trips are concurrent)	2	USGS
Field computers	3	USGS
Cameras	2	USGS
GPS units	3	USGS
25 ft Boston Whaler, if needed for carcass surveys, monitoring work	1	USGS
airplane GPS unit for sea otter surveys	1	USGS

FY16

Program Title: Nearshore Monitoring
Team Leader: Ballachey & Dean
Agency: USGS

FORM 4B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Long-term Oil Monitoring: Lingering Oil - Extending the Tracking of oil levels and weathering (PAH composition) in PWS through time

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Mark Carls, Jacek Maselko, & Mandy Lindeberg, NOAA/NMSF Auke Bay Laboratories, 907-789-6019, mark.carls@noaa.gov

Study Location: Sites in western Prince William Sound with persistent oil

Project Website: http://www.gulfwatchalaska.org/monitoring/lingering-oil/lingering-oil-weathering-and-tracking/

Abstract*:
This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et al. The goal was to provide the EVOSTC with an assessment of persistent Exxon Valdez oil in Prince William Sound, describe its chemical characteristics, and initiate a routine, long-term monitoring program that will resample the same sites every five years over the next 20 years. The field work for the first sampling was completed earlier this year and laboratory analyses are underway. Beach sampling was similar to surveys conducted by Auke Bay Laboratories during 2001 to 2005. Sediment samples were collected to estimate amounts of remaining oil and passive samplers were deployed to provide information about biologically available oil. Objectives are to complete the laboratory analysis and 1) fingerprint oil, 2) determine oil sources, 3) report oil persistence and weathering over decades, 4) determine biological availability, 5) produce a synthesis report, and 6) archive hydrocarbon data in the Trustee-sponsored hydrocarbon database. These data, together with the recently completed retrospective analysis of biomarkers (which are the most environmentally persistent components of the oil), will help investigators understand potential exposure levels (past and present) and linkages to species at higher trophic levels.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$19.6	$13.1	$8.7	$169.2	$6.5	$217.1

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$50.0	$50.0	$50.0	$50.0	$50.0	$250.0

** Figures given in $1,000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

Intertidal areas in western Prince William Sound were extensively coated with Exxon Valdez oil [1]. Oil remains in many beaches [2, 3], presumably with declining impacts on intertidal invertebrates (such as mussels [4, 5]) and predators such as sea otters and harlequin ducks [6-9]. Nine of the worst case sites were revisited in 2015 to continue the long term data set that tracks oil quantity and weathering composition in contaminated sediments, and established as long term oil monitoring sites to be re-sampled every 5 years over the next 20 years (Figure 1). Sites with a history of persistent subsurface oil were prioritized for monitoring based on: heavy subsurface oil surveyed in most recent years, a variety of shore types prone to oil retention, and those sites with a high probability of persistent oil [10]. The field work for the first sampling was completed earlier this year and laboratory analyses are underway. See Table 1 for sampled beaches.

Project objectives are to complete the laboratory analysis and 1) fingerprint oil, 2) determine oil sources, 3) report oil persistence and weathering over decades, 4) determine biological availability, 5) produce a synthesis report, and 6) archive hydrocarbon data in the Trustee-sponsored hydrocarbon database.

Fingerprinting oil will allow us to understand contamination source(s) and how they might influence aforementioned biota (objectives 1 and 2). Samples collected earlier this year will be analyzed to accomplish these objectives in FY16. Data will include PAHs, which can be modeled for source composition, geochemical biomarkers (triterpanes, hopanes, and steranes), which are particularly useful in definitive oil identification, and alkanes, which may provide additional insight on oil condition and source(s).

This project will produce a report in FY16 that reports current amounts of oil retained in beaches, including percent incidence, oiled area, and gravimetric estimates of oil mass (objective 3). These data will be combined with preceding time-series data to estimate oil persistence and re-assess long-term trends. The chemical analyses underway will allow us to estimate how much the oil has weathered, and this information will be compared to previous weathering data.

Passive samplers deployed in June 2015 during site surveys will be processed for hydrocarbons and assessed for biological availability (objective 4). These serve as surrogates for biological availability [11]; their 10 day deployment period coincided with sample dates (June 12 to June 21). All passive samplers were retrieved before beach disturbance. Total PAH estimates will provide estimates of exposure and contamination levels. As with sediments, the PAH composition in these samples should provide hydrocarbon source information, although this information will be less precise because at least two compartments (oil and water) are required for molecules to transfer into the samplers and thermodynamic processes (weathering) change composition.

This project will integrate previous survey and hydrocarbon data to produce a synthesis report and archive all analytical chemistry data in the hydrocarbon database (objectives 5 and 6). Thus, this project fills three needs: (1) understanding exposure levels (past and present) for species such as mussels, intertidal invertebrates, sea otters, and harlequin ducks, (2) understanding the natural degradation of quantity and composition of PAH over a long time course, and 3) definitive long-term source identification by triterpane, hopane, and sterane measurement. Understanding exposure doses is important to injured species, and this will complement biochemical biomarker evidence (cytochrome P4501A induction) of lingering exposure on sea otters and harlequin ducks [6-9]. Understanding oil loss over time and the probability of biological exposure is important for understanding full recovery of the habitat; in Alaska, this time course is apparently longer than in

lower latitude environments. This study complements and extends previous work, including the remediation studies by Boufadel in 2011-12 as well as the Irvine study outside of PWS in 2011-12.

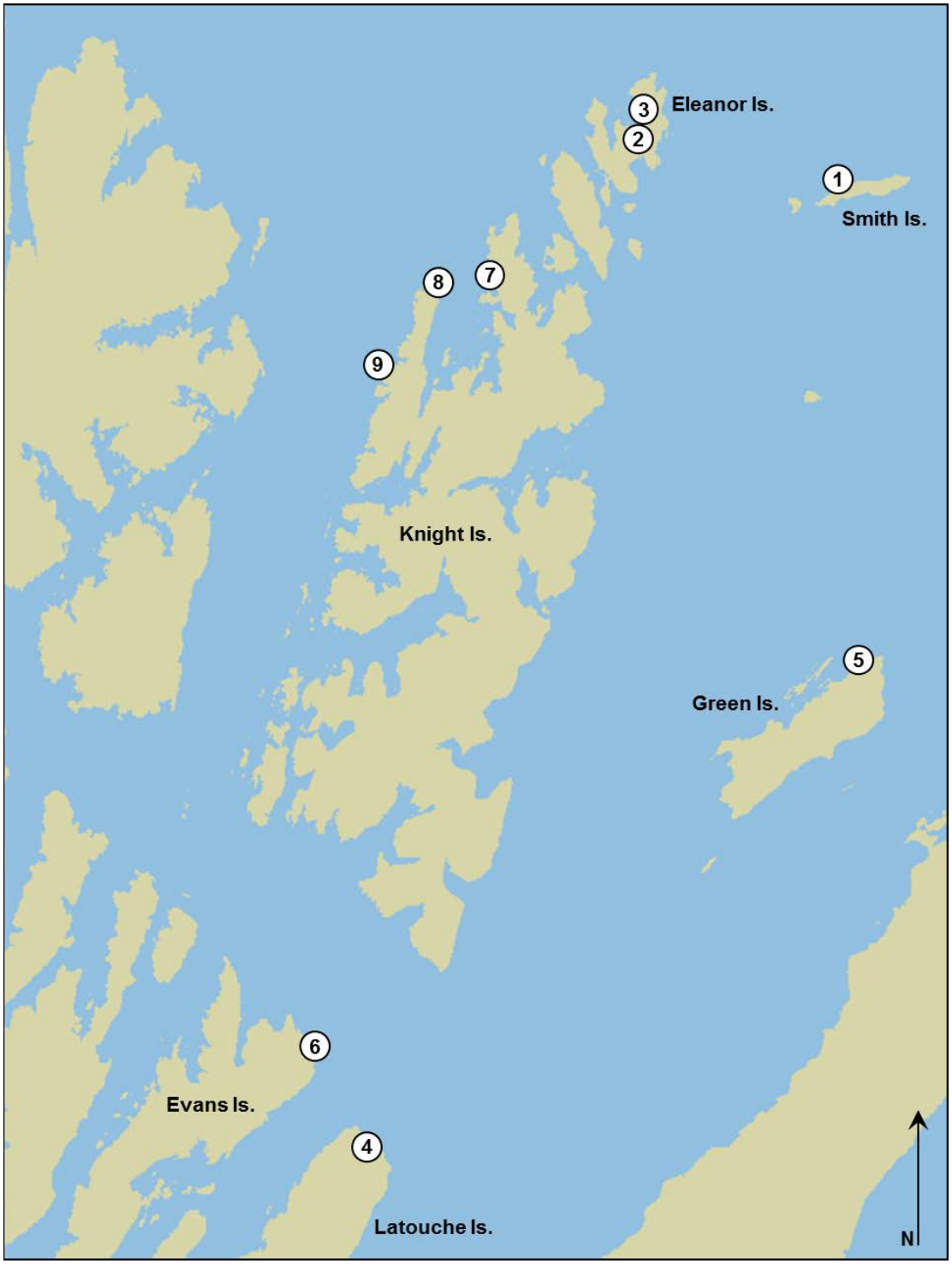

Figure 1. Prioritized sites surveyed during June 2015 for monitoring lingering oil in western Prince William Sound.

Table 1. Long-term oil monitoring sites.

	Location Name	Shore Segment	Initial oiling/cleanup	Remediation	Oil Survey Excavation History	Shore type prone to persistent oil	Michel Model Heavy SSO
1	Smith Is.	SM006B	Heavy oil 1990-1993	Boufadel 2005-12	1989-921, 20013, 20084	armored	>30%
2	Northwest Bay, Eleanor Is.	EL056C	Medium oil 1990-1993	Boufadel 2005-12	20013, 20074	rubble accumulations	>30%
3	Northwest Bay, Eleanor Is.	EL058B	Heavy oil1989 only	Boufadel 2005-12	20013, 20053	breakwater	>30%
4	Sleepy Bay, Latouche Is.	LA018A-1	Heavy oil1990-1993		1989-921, 20013, 20053	rubble, slope	5-15%
5	Green Is.	GR103B	Heavy oil 1990-1993		20013, 20053, 20074	armored, slope	1-5%
6	N. Evans Is.	EV039A	Heavy oil 1990-1993	PES-51® 1997	19932, 20053	edge effect	1-5%
7	Herring Bay, Knight Is.	KN0114A	Heavy oil1990-1993		2003 3	breakwater	>30%
8	Herring Pt., Knight Is.	KN0300A-2	Medium oil 1990-1993		19932, 20053	breakwater	1-5%
9	Herring Pt., Knight Is.	KN0506A	Heavy oil 1990-1993		20013, 20053	edge effect	0-1%

Note for oil survey excavation history: 1. NOAA ORR surveys; 2. Gibeaut surveys; 3. NOAA ABL surveys; 4. Michel surveys.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

This study is closely linked with the benthic component of the Gulf Watch Alaska program and is designed to provide insight into the persistence and nature of EVO in the nearshore ecosystem and a method for long term monitoring. Contaminant samples (mussels and sediments) collected by the benthic component surveys have been sent through Auke Bay Laboratories (ABL) to maintain proper handling and chain of custody. Analyses not provided by ABL were managed by ABL staff to other NOAA contracted labs. ABL staff has also been available for interpretation of these analyses for deliverables and publications.

This project provides a chemical frame of reference for other studies in PWS and the Gulf of Alaska, including 1) definitive long-term source identification of lingering oil, (2) the weathering status of lingering oil, and 3) an understanding of exposure levels (past and present) for key prey species being monitored by the benthic component such as mussels for sea otters and sea ducks. This study complements and extends previous lingering oil work [2, 3, 10, 12, 13], continued management of the Trustee hydrocarbon database, analyses for the remediation studies by Boufadel during 2011-2012, and long term monitoring by Irvine studies outside of PWS [14-16].

B. With Other EVOSTC-funded Projects

N/A

C. With Trustee or Management Agencies

NOAA has trust responsibilities for oil spill response and restoration. Data collected under this study furthers our understanding of oil persistence in coastal habitats.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

Objectives are to complete the laboratory analysis and 1) fingerprint oil, 2) determine oil sources, 3) report oil persistence and weathering over decades, 4) determine biological availability, 5) produce a synthesis report, and 6) archive hydrocarbon data in the Trustee-sponsored hydrocarbon database.

B. Changes to Project Design

N/A

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. Fingerprint oil. January 2016.

Objective 2. Determine oil sources. February 2016

Objective 3. Report oil persistence and weathering. Rough draft report April 2016

Objective 4. Determine biological availability. February 2016

Objective 5. Produce a synthesis report; rough draft April 2016

Objective 6. Archive hydrocarbon data. February 2016

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)
Continue analyses
November: Attend Gulf Watch PI meeting
January: Attend AMSS
February: Annual Report to EVOTC

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)
June: Complete & submit final report

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)
September: Complete all metadata and post data on Ocean Workspace

FY 16, 4th quarter (November 1, 2016- January 31, 2017)
N/A

V. PROJECT PERSONNEL – CHANGES AND UPDATES

N/A

VI. BUDGET

A. Budget Forms (Attached)

Completed budget forms have been provided.

B. Changes from Original Proposal

The project budget remains as proposed and implemented.

C. Sources of Additional Funding

NMFS equipment and expertise, including unfunded labor, are essential to completion of this project

References

[1] Neff JM, Owens EH, Stoker SW, McCormick DM. 1995. Shoreline oiling conditions in Prince William Sound following the *Exxon Valdez* oil spill. *Exxon Valdez* oil spill: fate and effects in Alaskan Waters, Philadelphia, PA, pp 312-346.

[2] Short JW, Irvine GV, Mann DH, Maselko JM, Pella JJ, Lindeberg MR, Payne JR, Driskell WB, Rice SD. 2007. Slightly weathered *Exxon Valdez* oil persists in Gulf of Alaska beach sediments after 16 years. *Environmental Science & Technology* 41:1245-1250.

[3] Short JW, Maselko JM, Lindeberg MR, Harris PM, Rice SD. 2006. Vertical distribution and probability of encountering intertidal Exxon Valdez oil on shorelines of three embayments within Prince William Sound, Alaska. *Environmental Science & Technology* 40:3723-3729.

[4] Carls MG, Babcock MM, Harris PM, Irvine GV, Cusick JA, Rice SD. 2001. Persistence of oiling in mussel beds after the *Exxon Valdez* oil spill. *Mar Environ Res* 51:167-190.

[5] Carls MG, Harris PM, Rice SD. 2004. Restoration of oiled mussel beds in Prince William Sound, Alaska. *Mar Environ Res* 57:359-376.

[6] Esler D, Bowman TD, Trust KA, Ballachey BE, Dean TA, Jewett SC, O'Clair CE. 2002. Harlequin duck population recovery following the '*Exxon Valdez*' oil spill: progress, process and constraints. *Mar Ecol Prog Ser* 241:271-286.

[7] Esler D, Schmutz JA, Jarvis RL, Mulcahy DM. 2000. Winter survival of adult female harlequin ducks in relation to history of contamination by the *Exxon Valdez* oil spill. *J Wildlife Manage* 64:839-847.

[8] Bodkin JL, Ballachey BE, Dean TA, Fukuyama AK, Jewett SC, McDonald L, Monson DH, O'Clair CE, VanBlaricom GR. 2002. Sea otter population status and the process of recovery from the 1989 *Exxon Valdez* oil spill. *Mar Ecol Prog Ser* 241:237-253.

[9] Bodkin JL, Esslinger GG, Monson DH. 2004. Foraging depths of sea otters and implications to coastal marine communities. *Mar Mammal Sci* 20:305-321.

[10] Michel J. 2010? Report on recent lingering oil studies. EVOSTC project 070801?

[11] Carls MG, Holland LG, Short JW, Heintz RA, Rice SD. 2004. Monitoring polynuclear aromatic hydrocarbons in aqueous environments with passive low-density polyethylene membrane devices. *Environ Toxicol Chem* 23:1416-1424.

[12] Short JW, Lindeberg MR, Harris PM, Maselko JM, Pella JJ, Rice SD. 2004. Estimate of oil persisting on the beaches of Prince William Sound 12 years after the Exxon Valdez oil spill. *Environmental Science & Technology* 38:19-25.

[13] Nixon Z, al e. 2015? Lingering oil in Prince William Sound, Alaska - update, Not yet available.

[14] Irvine GV, Mann DH, Carls MG, Holland LG, Reddy CM, Nelson RK, Aeppli C. 2014. Lingering oil on boulder-armored beaches in the Gulf of Alaska 23 years after the Exxon Valdez oil spill.

[15] Irvine GV, Mann DH, Short JW. 2006. Persistence of 10-year old *Exxon Valdez* oil on Gulf of Alaska beaches: The importance of boulder-armoring. *Mar Pollut Bull* 52:1011-1022.

[16] Irvine GV, Mann DH, Short JW. 1999. Multi-year persistence of oil mousse on high energy beaches distant from the Exxon Valdez spill origin. *Mar Pollut Bull* 38:572-584.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Travel	$1.5	$1.5	$1.5	$4.2	$1.5	$10.2	
Contractual	$14.0	$9.0	$5.5	$130.0	$4.0	$162.5	
Commodities	$2.5	$1.5	$1.0	$21.0	$0.5	$26.5	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (will vary by proposer)							
SUBTOTAL	$18.0	$12.0	$8.0	$155.2	$6.0	$199.2	
General Administration (9% of subtotal)	$1.6	$1.1	$0.7	$14.0	$0.5	$17.9	
PROJECT TOTAL	$19.6	$13.1	$8.7	$169.2	$6.5	$217.1	
Other Resources (in kind Funds)	$50.0	$50.0	$50.0	$50.0	$50.0	$250.0	

Original COMMENTS: Portions of permanent staff salaries will be donated, including Dr. Jeep Rice, Mark Carls, Marie Larsen, Larry Holland, Josie Lunasin, and Mandy Lindeberg.

FY12-16

Program Title: 16120114-S Lingering Oil Monitoring
Team Leader: Mark Carls

FORM 4A
TRUSTEE AGENCY
SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	0.0	0.0	
				Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
one trip, Alaska Marine Science Symposium	0.5	1	5	0.2	1.5
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.5

FY16

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
PERSONNEL & TRAVEL DETAIL

Contractual Costs:	Contract
Description	Sum
technician, hydrocarbon processing	4.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$4.0

Commodities Costs:	Commodities
Description	Sum
solvents and supplies for hydrocarbon processing	0.5
Commodities Total	$0.5

FY16

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency
muffle furnace		
HPLC		
GC/FID		
GC/MS		
ACE - accelerated solvent extractor		
steam tables		
glassware		
freezers		
balances		
computers		

FY16

Program Title: Lingering Oil Monitoring
Team Leader: Mark Carls
Agency: NOAA / NMFS / Auke Bay Laboratories

FORM 4B
EQUIPMENT DETAIL

FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Collaborative Data Management and Holistic Synthesis of Impacts and Recovery Status Associated with the Exxon Valdez Oil Spill

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Matthew B. Jones, National Center for Ecological Analysis and Synthesis (NCEAS)

Study Location: Entire Exxon Valdez oil spill affected area

Project Website (if applicable): www.gulfwatchalaska.org, https://goa.nceas.ucsb.edu/

Abstract*: The AOOS-led Long-Term Monitoring (LTM) and the PWSSC-led Herring Research and Monitoring (HRM) programs propose an ambitious monitoring and research agenda over the next five years. These efforts could facilitate a more thorough understanding of the effects of the oil spill if the new data and information on the spill-affected ecosystems are effectively managed and collated along with historical data on these systems, and then used in a comprehensive synthesis effort. We propose a collaboration among NCEAS and the AOOS LTM and HRM teams to help build an effective data management cyberinfrastructure for proposed monitoring efforts and organize these data with historical data, including previous EVOSTC-funded efforts, to prepare for synthesis and ensure all data are organized, documented and available to be used by a wide array of technical and non-technical users. Building on the LTM and HRM syntheses and modeling efforts and the 20-year historical data from EVOSTC projects and any available current data, NCEAS would convene two cross-cutting synthesis working groups to do a full-systems analysis of the effects of the 1989 oil spill on Prince William Sound and the state of recovery of the affected ecosystems.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$416.8	$464.7	$372.1	$379.2	$73.9	$1,706.7

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

** Funds expressed in $1000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

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

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

Data collected prior to and in response to the Exxon Valdez oil spill are profoundly heterogeneous. They range from long-term, automated sensing of oceanographic and atmospheric conditions, to short-term, experimental, monitoring, and behavioral studies of biological components of the system. The scientific data to be collected in these studies includes data on population trends, behavior, physiology, disease, and genetics of many species, as well as oceanographic and meteorological data at both regional and local scales. This diversity of data and data collection protocols substantially complicates data management by EVOSTC long-term monitoring projects. In addition, investigators on both the long-term monitoring and herring population studies are affiliated with many different institutions and agencies, each currently collecting data from many sites within the spill region and managing it within the frameworks dispersed among these agencies. Any data management system will necessarily need to accommodate this heterogeneity and dispersion by preserving the original data and providing mechanisms to access, integrate, and analyze the data for crosscutting synthesis. Data management activities for oceanographic information occur in isolated, physically distributed agencies, leading to low cross-agency utilization of data. Technical barriers, complex data formats, a lack of standardization and missing metadata have limited access to data and made the utilization of available scientific information cumbersome and daunting. As a consequence, existing data is underutilized and often has not undergone quality assurance.

In this proposal, we outline the collaboration between the National Center for Ecological Analysis and Synthesis (NCEAS), the Alaska Ocean Observing System (AOOS) and their partner Axiom Consulting, and the investigators of the pending Long Term Monitoring (LTM - proposal submitted by McCammon et al.) and Herring Research and Monitoring (HRM – proposal submitted by Pegau et al.) programs. This project will augment the expertise in data management and synthesis of these groups to maximize the efficiency of data collection and management for the LTM and HRM programs and expand access to these data, collate additional historical data that are useful for synthesis from the EVOS affected area, and conduct a broad-ranging synthesis of twenty years of EVOSTC funded research data to generate a comprehensive assessment of ecosystem impacts and recovery status for the spill affected area.

This collaboration document augments the data management, infrastructure development, and synthesis activities previously proposed by the AOOS partners with additional objectives that introduce new

technologies from NCEAS to jointly improve the data management infrastructure available to researchers, broaden the scope of data collation and integration, and embark on an ambitious synthesis plan (Figure 1). During the first three years, NCEAS has focused on mining historical data and contributing to development of both the AOOS cyberinfrastructure and the DataONE Federation infrastructure in order to create the necessary data resources for synthesis; during years 3-5, NCEAS has been conducting a multi-year working group effort to synthesize what is known about spill effects and recovery of ecosystems. These activities will be interwoven with the complementary but distinct data management, technology development, and analysis activities previously proposed by Axiom and AOOS and which are referenced in the objectives below.

II. COORDINATION AND COLLABORATION

A. Within an EVOTC-Funded Program

- Alaska Ocean Observing System (AOOS), Axiom Consulting: NCEAS project participants have coordinated cyberinfrastructure development to link the AOOS/Axiom data management system to broader community infrastructure, including the DataONE project. This work will be completed in FY16 with the full integration of the historical data portal to AOOS to operate as a DataONE member node.
- Gulf Watch Alaska and Herring Research and Monitoring (HRM): NCEAS has worked with all current Gulf Watch Alaska and Herring Research and Monitoring researchers to collate, document, and archive data collected under these programs, and to make this data widely available to the research community.

B. With Other EVOSTC-funded Projects

Numerous historically funded EVOS projects: NCEAS has worked with researchers from historically funded EVOSTC projects to collate, document, and archive data collected under these programs, and to make this data widely available to the research community. This collaboration has allowed us to collate a rich set of data arising from past Trustee project funding.

C. With Trustee or Management Agencies

This proposal was originally in response to a request for involvement in data management activities from Elise Hsieh, with the stated goal to connect the data management activities of the project to other activities in which we are involved, including DataONE and related efforts.

Conduct of the synthesis working groups described below is done in collaboration with the National Center for Ecological Analysis and Synthesis, as well as many participating scientists that volunteer their time to work on integrative synthesis. These collaborations are highly productive because of the diversity and intensity of the participating scientists. NCEAS working groups under this project are led by community researchers, including:

- Predicting CGoA dynamics Working Group
  - Thomas A. Okey, School of Environmental Studies, University of Victoria
  - Terrie Klinger, School of Marine and Environmental Affairs, University of Washington
  - James J. Ruzicka, Cooperative Institute for Marine Resources Studies, Oregon State University
- Gulf of Alaska portfolio effects Working Group
  - Kristin Marshall, School of Aquatic and Fishery Sciences , University of Washington
  - Anne Beaudreau, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks

- Richard Brenner, Alaska Department of Fish and Game Division of Commercial Fisheries
- Mary Hunsicker, National Center for Ecological Analysis and Synthesis
- Eric Ward, NOAA Northwest Fishery Science Center
- A. Ole Shelton, NOAA Northwest Fishery Science Center

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

Objective 1. Provide data management oversight and services for EVOS LTM project team data centric activities that include data structure optimization, metadata generation, and transfer of data between project teams.

Status: Completed during years 1-3, but with a small emphasis during years 4-5 on ongoing consultation. Dependent upon continued collaboration by other project participants.

Objective 2. Consolidate, standardize and provide access to related and historic data sets that are critical for retrospective analysis, synthesis and model development within the LTM and HRM programs.

Status: This activity is complete from years 1-3 (recoverable data sets have been collated, but many remain that are non-recoverable), but will continue to gather specific data sets that target specific data needs for synthesis working group activities in years 4-5. A new data recovery effort is described in Changes to Project Design.

Objective 3. Develop tools for user groups to access, analyze and visualize information produced or processed by the LTM and HRM efforts.

Status: Completed, in that we have developed and released analysis and visualization tools in R that provide direct access to the historical data collected and deposited in the AOOS member node of DataONE.

Objective 4. Organize, integrate, analyze, and model the 20-year historical data from EVOSTC-funded projects and other monitoring in the spill area in preparation for LTM and HRM program and NCEAS working group synthesis efforts

Status: Historical data are now documented and organized through the single GoA Data Portal, and are accessible via analytical scripting systems such as R. The Projects Data Coordinator has worked on integration of key data sets, including ADCP data across the study area, seabird data, and others. Results of these integrations are also being pushed to the GoA member node as derived data products that can be reused in synthesis efforts. Some of these products are being further developed by the synthesis working groups that started work in year 4 and continue through year 5.

Objective 5. Integrate all data, metadata and information products produced from this effort into the AOOS data management system for long-term storage and public use.

Status: All historical that have been collated to date have been archived in the AOOS data systems, and additional data from synthesis activities are added as they are identified,

collated, and documented. The NCEAS Data Coordinator (Couture) continues to work with groups to produce syntheses of the various historical and contemporary data sets. Emphasis has shifted in year 4 and 5 to focus on data integration needed for the two NCEAS synthesis working groups.

Objective 6. Augment AOOS/IOOS preservation and interoperability system with other data systems through integration of DataONE services.

Status: The Gulf of Alaska Member node has been developed, tested, and deployed (https://goa.nceas.ucsb.edu). All historical that have been collated to date have been archived in DataONE and replicated across multiple nodes, and additional data are added as they are identified, collated, and documented. Historical data can be accessed at https://goa.nceas.ucsb.edu in addition to the AOOS site and the DataONE data portal (https://cn.dataone.org).

Objective 7. Conduct broad synthesis activities on spill impacts and recovery as part of whole-ecosystem analysis through NCEAS working groups.

Status: Two working groups have been selected and developed in year 3, and are conducting synthesis activities in years 4-5. Two postdocs, Rachael Blake and Colette Ward, were recruited and started in January 2015 to work with these working groups.

B. Changes to Project Design

While the overall objectives have not changed, some of the activities have shifted in time due to the delayed selection of working groups and postdocs, and to reconsideration of project priorities. These changes come in three principal areas: 1) delayed synthesis working groups and postdocs; 2) renewed effort to integrate DataONE support in AOOS, and 3) additional historical data recovery.

1) *Delayed synthesis groups and postdocs*. Synthesis groups were originally scheduled to hold two meetings in each of project years 3 and 4, but due to an extended selection and peer review process, these groups did not convene until the beginning of year 4. Each of the synthesis working groups held their inaugural meeting in the first half of year 4, and has their second meeting is scheduled for September and October of year 4. The third and fourth meetings are scheduled for year 5. Similarly, both postdoctoral fellow positions were shifted to years 4 and 5 to support and expand working group synthesis activities. While the schedule has shifted, the deliverables in terms of synthesis papers has not changed. The budget for the year 5 request has not changed, but we will plan to roll funds forward from years 3 and 4 to cover these additional synthesis and postdoctoral costs in year 5.

2) *Renewed effort to integrate DataONE support in AOOS*. The Gulf of Alaska Member Node was established as part of the DataONE federation and deployed in year 3, but is currently still a separate part of the infrastructure than other services that AOOS maintains. Thus, there are two separate data portals, one within AOOS for current monitoring, and one at NCEAS holding historically collated data and data from synthesis activities. The historical data was manually deposited in the AOOS Ocean Workspace, but this process does not allow automated synchronization between the data systems. NCEAS, AOOS, Gulf Watch Alaska, and Axiom met to discuss how to remediate this, and have established a two-stage plan to eliminate this redundancy. First, Axiom will work in the remaining months of Year 5 to automate the process of ingesting metadata and data from DataONE compatible data repositories, which will streamline the process of ingesting data from the NCEAS synthesis efforts, as well as new historical data that are rescued (see next section). NCEAS will provide a part-time software engineer to help design and implement this effort and consult on the DataONE system.

Second, in year 5, we will use remaining rollover funds for software engineering from years 4 and prior to help Axiom to develop a full implementation of DataONE member node within the AOOS-maintained systems. This will include: 1) supporting the REST APIs from DataONE directly within Axiom, and 2) both ingestion and production of standard metadata and data formats used in the DataONE federation (focused mainly on ISO 19139 and Ecological Metadata Language). Time for this joint design and development activity has been budgeted in year 5 by utilizing rollover funds from previous years. When complete, the current historical data portal will be shut down and replaced by an AOOS DataONE member node.

3) *Additional historical data recovery*. The original historical data recovery effort in years 1-3 identified data collected from all prior EVOSTC-funded projects, prioritized these, and attempted to recover and the data through a series of email and personal contacts with the original investigators. Currently, 27% of these identified historical data sets have been recovered and archived, with the remainder still unrecovered due to several reasons, including retirement of key personnel, destruction of the data, unresponsiveness of key personnel, and at times the amount of labor required to digitize original paper files and notebooks. We do not feel that additional data can be recovered using the approach to email and phone contacts that we employed in years 1-3. However, in discussions with Gulf Watch Alaska leadership, we have agreed that recovering additional high-priority data sets would be extremely valuable to synthesis efforts and to long-term, retrospective analysis. There was general agreement that GWA leadership could assist in the recovery effort by utilizing their personal networks at the various state, federal, and university organizations that hold the data. Thus, we plan to use rollover funds from years 1-4 to restart a data rescue effort to obtain, document, and publish additional high-priority data sets from prior funding and from related efforts in the region. This work will be accomplished in phases. First, the existing listing of historical data will be reviewed and organized, with explanations provided on the status of each data set and the potential effort involved and barriers to recovery. Second, this listing will then be reviewed and triaged by GWA leadership to identify the high priority targets, and those will be examined to determine which are both tractable and amenable to alternative approaches for recovery. For example, lack of time from agency personnel was a large barrier to recovery for many data sets, and we will utilize high-level contacts within those agencies to raise these items as priorities for agency staff. Third, the Projects Data Coordinator (Couture) and two student interns at NCEAS will correspond with these agency staff to identify, obtain, understand, document, and deposit the data in the Gulf Watch repositories. Upon review and approval of the original data creators, we will publish the data sets with citable identifiers and make them available to the broad community of researchers and the public. These data, like the other historical data recovered, will be deposited in a DataONE compatible repository, and replicated at multiple sites to ensure preservation and accessibility. Funds for these students and the additional time for the data coordinator will be drawn from rollover funds from prior project years.

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. Provide data management oversight and services for EVOS LTM project team data centric activities that include data structure optimization, metadata generation, and transfer of data between project teams.
Completed during years 1-3.

Objective 2. Consolidate, standardize and provide access to related and historic data sets that are critical for retrospective analysis, synthesis and model development within the LTM and HRM programs.

Completed during years 1-3. A new data recovery effort is described in Changes to Project Design for year 5. To be met by January 2017.

Objective 3. Develop tools for user groups to access, analyze and visualize information produced or processed by the LTM and HRM efforts.
Completed in years 1-3.

Objective 4. Organize, integrate, analyze, and model the 20-year historical data from EVOSTC-funded projects and other monitoring in the spill area in preparation for LTM and HRM program and NCEAS working group synthesis efforts.
Completed during year 4. Some of these products are being further developed by the synthesis working groups that started work in year 4 and continue through year 5.

Objective 5. Integrate all data, metadata and information products produced from this effort into the AOOS data management system for long-term storage and public use.
Completed for historical data in years 1-3. Additional data to be deposited in year 5 after second recovery effort. To be met by January, 2017.

Objective 6. Augment AOOS/IOOS preservation and interoperability system with other data systems through integration of DataONE services.
Completed deployment of historical data node for DataONE in years 1-3. Additional integration planned for AOOS systems in year 5. To be met by December, 2016.

Objective 7. Conduct broad synthesis activities on spill impacts and recovery as part of whole-ecosystem analysis through NCEAS working groups.
In progress during years 4-5. To be met by January, 2017.

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

February: *Assess year 1-4 datasets and metadata historical data collations, prioritize new collation*
Completed consultation with Axiom on data and metadata ingest from DataONE
March: *Continue synthesis group analysis activities*
April: *Completed contact with priority historical data PIs and organizations*

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

July: *Completed the 3rd working group meeting for each of two NCEAS synthesis groups*
Collated data from high and medium priority historical data projects
Start metadata generation for historical data, and publish after each is reviewed

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

October: *Completed the 3rd working group meeting for each of two NCEAS synthesis groups*
Complete metadata generation for historical data, and publish after each is reviewed

FY 16, 4th quarter (November 1, 2016- January 31, 2017)

November: *Participate in LTM program PI meeting*
December: *Completed the 4th working group meeting for each of two NCEAS synthesis groups*
Completed consulting with Axiom on design and deployment of an AOOS Member Node
January: *Complete publication of any final historical data sets*
Submit any remaining synthesis group papers and products for publication

V. PROJECT PERSONNEL – CHANGES AND UPDATES

No changes to senior personnel.

VI. BUDGET

A. Budget Forms (Attached)

Attached.

B. Changes from Original Proposal

Our original budget request for FY16 has not changed, and remains at $67,766 for the year 5 effort.

To accommodate the schedule shifts and changes to project priorities above, we plan to use the remaining funds from years 1-4 to complete the objectives as described above in section IV. As described in section III.B above, we plan to use the prior-year funding to:

1. Postdocs: Both postdocs will be employed through the end of year 5 ($115,995)
2. Working groups
    - Both working groups will continue to meet in year 5 to complete their work ($118,200)
    - Added honoraria for working group leads to compensate for their time in organizing and planning working groups ($36,000)
3. Cyberinfrastructure design and development for AOOS DataONE integration ($36,472)
4. Data rescue effort
    - Student interns for new data rescue effort ($46,201)
    - Increase projects data coordinator time for data rescue to 60% for 12 months ($41,771)
5. Additional travel to GWA PI meeting, and scientific conferences for postdocs (increase by $1,271 in year 5)

Cumulatively, these shifts in the expenditure of prior year funds to year five will allow us to complete both the original objectives slated for year 5, plus the additional objectives from years 4 and previous that shifted due to changes in timing (such as the working groups) and increases in priority of the data rescue effort. In addition to the original $67,766 for year 5, the total rollover expenditures from prior years will be $447,625.

C. Sources of Additional Funding

N/A

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$294.2	$329.1	$148.6	$153.7	$41.5	$967.1	
Travel	$2.8	$2.8	$121.0	$121.0	$2.8	$250.3	
Contractual	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Supplies	$6.5	$6.5	$1.4	$1.4	$9.5	$25.3	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (will vary by proposer)	$78.9	$88.0	$70.5	$71.8	$14.0	$323.1	
SUBTOTAL	$382.4	$426.3	$341.4	$347.9	$67.8	$1,565.8	
General Administration (9% of subtotal)	$34.4	$38.4	$30.7	$31.3	$6.1	$140.9	
PROJECT TOTAL	$416.8	$464.7	$372.1	$379.2	$73.9	$1,706.7	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	

COMMENTS:

FY12-16

Program Title:16120120 Collaborative Data Management and Holistic Synthesis of Impacts and Recovery Status Associated with the Exxon Valdez Oil Spill
Team Leader:Matthew B. Jones

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Matthew Jones, Principal Investigator	Data Management & Synthesis	2.0	14.1		28.2
Scientific Programmer - TBN	Data Management & Synthesis	12.0	1.1		13.3
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	15.2	0.0	
				Personnel Total	$41.5

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Project meetings with LTM, HRM, AOOS, and Axiom partners	0.8	2	6	0.2	2.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$2.8

FY16

Program Title:Collaborative Data Management and Holistic Synthesis of Impacts and Recovery Status Associated with the Exxon Valdez Oil Spill
Team Leader:Matthew B. Jones

FORM 3B
PERSONNEL & TRAVEL DETAIL

Contractual Costs: Description	Contract Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Supplies Costs: Description	Supplies Sum
Communications charges (long-distance, fax, fedex, web conferencing, etc.)	0.5
Publication graphics, Open access charges, page charges	9.0
Supplies Total	$9.5

FY16

Program Title:Collaborative Data Management and Holistic Synthesis of Impacts and Recovery Status Associated with the Exxon Valdez Oil Spill
Team Leader:Matthew B. Jones

FORM 3B
CONTRACTUAL & Supplies DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY16

Program Title:Collaborative Data Management and Holistic Synthesis of Impacts and Recovery Status Associated with the Exxon Valdez Oil Spill
Team Leader:Matthew B. Jones

FORM 3B
EQUIPMENT DETAIL