EVOSTC FY17-FY21 INVITATION FOR PROPOSALS
FY18 CONTINUING PROJECT PROPOSAL SUMMARY PAGE

Project Number and Title

Gulf Watch Alaska: Nearshore Component Project

18120114-H—Nearshore ecosystems in the Gulf of Alaska

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Date Proposal Submitted

August 23, 2017

Project Abstract

Nearshore monitoring in the Gulf of Alaska (GOA) provides ongoing evaluation of the status and trend of more than 200 species, including many of those injured by the 1989 *Exxon Valdez* oil spill (EVOS). The monitoring design includes spatial, temporal and ecological features that support inference regarding drivers of change. Application of this monitoring design to date include assessment of change in sea otter populations in relation to EVOS recovery and density dependent factors as well as the assessment of the relative roles of static versus dynamic environmental drivers in structuring benthic communities. Continued monitoring will lead to a better understanding of variation in the nearshore ecosystem across the GOA and a more thorough evaluation of the status of spill-injured resources. This information will be critical for anticipating and responding to ongoing and future perturbations in the region, as well as providing for global contrasts. In 2018 we propose to continue sampling in Kachemak Bay, Katmai National Park and Preserve, Kenai Fjords National Park, and Western Prince William Sound following previously established methods. Monitoring metrics include marine invertebrates, macroalgae, sea grasses, birds, mammals, and physical parameters such as temperature. In addition to taxon-specific metrics, monitoring includes recognized important ecological relations such as predator-prey dynamics, measures of nearshore ecosystem productivity, and contamination. Preliminary FY17 observations indicate low sea star densities across all four regions, while nearshore bird surveys of common murre distributions have returned to pre die-off states. We are not proposing any major changes to this project for FY18.

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

FY17	FY18	FY19	FY20	FY21	TOTAL
$401,900	**$452,700**	**$411,400**	**$402,300**	**$402,800**	**$2,071,000**

Non-EVOSTC Funds to be used, please include source and amount per source: (see Section 6C for details)

FY17	FY18	FY19	FY20	FY21	TOTAL
$410,000	**$410,000**	**$410,000**	**$392,000**	**$392,000**	**$2,014,000**

1. EXECUTIVE SUMMARY

Nearshore marine ecosystems face significant challenges at global and regional scales, with threats arising from both the adjacent lands and oceans. An example of such threats was the 1989 grounding of the T/V *Exxon Valdez* in Prince William Sound (PWS). An important lesson arising from this event, as well as similar events around the world, was that understanding the structure and function of the ecosystem and the processes that drive it are essential when responding to and managing present and anticipated threats.

The nearshore is broadly recognized as highly susceptible and sensitive to natural and human disturbances on a variety of temporal and spatial scales (reviewed in Valiela 2006, Bennett et al. 2006, Dean and Bodkin 2006, Dean et al. 2014). For example, changes in nearshore systems have been attributed to such diverse causes as global climate change (e.g., Barry et al. 1995, Sagarin et al. 1999, Hawkins et al. 2008, Hoegh-Guldberg and Bruno 2010, Doney et al. 2012), earthquakes (e.g., Baxter 1971, Noda et al., 2015), oil spills (e.g., Peterson 2001, Peterson et al. 2003, Bodkin et al. 2014), human disturbance and removals (e.g., Schiel and Taylor 1999, Crain et al. 2009, Fenberg and Roy 2012), and influences of invasive species (e.g., Jamieson et al. 1998, O'Connor 2014). Nearshore systems are especially good indicators of change because organisms in the nearshore are relatively sedentary, accessible, and manipulable (e.g., Dayton 1971, Sousa 1979, Peterson 1993, Lewis 1996). In contrast to other marine habitats, there is a comparatively thorough understanding of mechanistic links between species and their environment (e.g., Connell 1972, Paine 1974, 1977, Estes et al. 1998, Menge and Menge 2013, Menge et al. 2015) that facilitates understanding causes for change. Many of the organisms in the nearshore are sessile or have relatively limited home ranges, providing a geographic link to sources of change. Nearshore habitats likely will have detectable changes in the future, and we will be able to detect relatively localized sources of change, assess human induced vs. naturally induced changes, and provide suggestions for management of human impacts.

The Nearshore Component of the Gulf Watch Alaska (GWA) long-term monitoring project investigates and monitors the nearshore environment of the greater *Exxon Valdez* oil spill (EVOS) area, with focus on selected elements of the nearshore food web (Figure 1). Our overarching goal is to understand drivers of variation in the Gulf of Alaska (GOA) nearshore ecosystem. The foundational hypotheses of the Nearshore Project include: (1) What are the spatial and temporal scales over which change in nearshore ecosystems is observed? (2) Are observed changes related to broad-scale environmental variation, local perturbations, or underlying ecological processes? (3) Does the magnitude and timing of changes in nearshore ecosystems correspond to those measured in pelagic ecosystems? The design features of the nearshore monitoring program include a rigorous site selection process that allows statistical inference over various spatial scales (e.g., GOA and regions within the GOA) as well as the capacity to evaluate potential impacts from more localized sources, especially those resulting from human activities, including lingering effects of EVOS (Figure 2). In addition to detecting change at various spatial scales, design features incorporate both static (e.g., substrate, exposure, and bathymetry) and dynamic (e.g., variation in oceanographic conditions, productivity, and predation) drivers as potential mechanisms responsible for change. More than 200 species dependent on nearshore habitats, many with well-recognized ecological roles in the nearshore food web, are monitored annually within four regional blocks in the GOA. Evaluation of those species over time in relation to well-defined static and dynamic drivers will allow accurate and defensible measures of change and support management and policy needs addressing nearshore resources both within the GOA and globally.

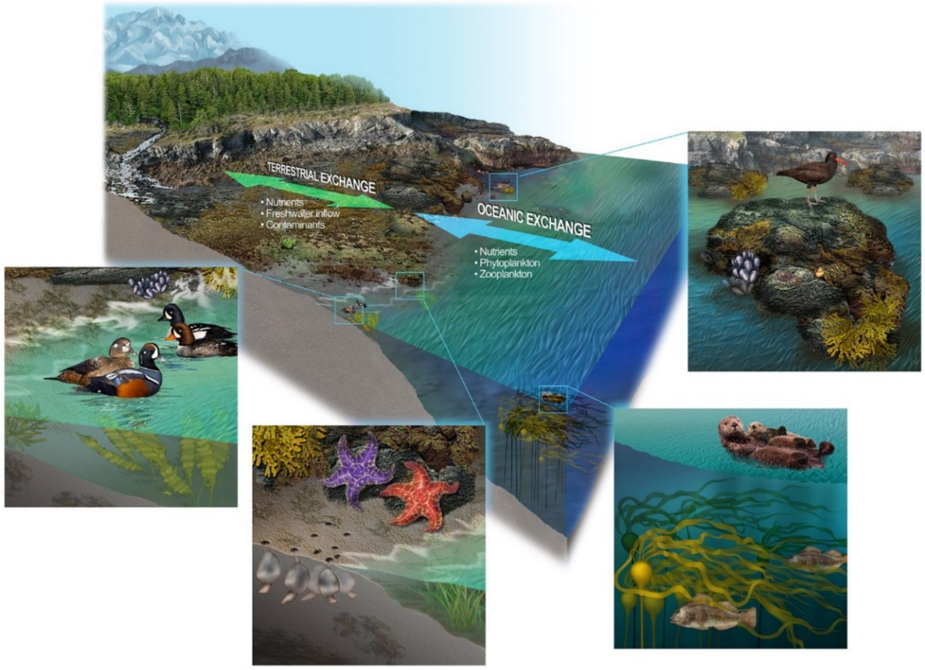

Figure 1. Conceptual illustration of the nearshore food web with terrestrial and oceanic influences indicated. Sea otters, black oystercatchers, sea ducks and sea stars act as the top-level consumers in a system where primary productivity originates mostly from the macroalgae and sea grass and moves through benthic invertebrates to the top level consumers.

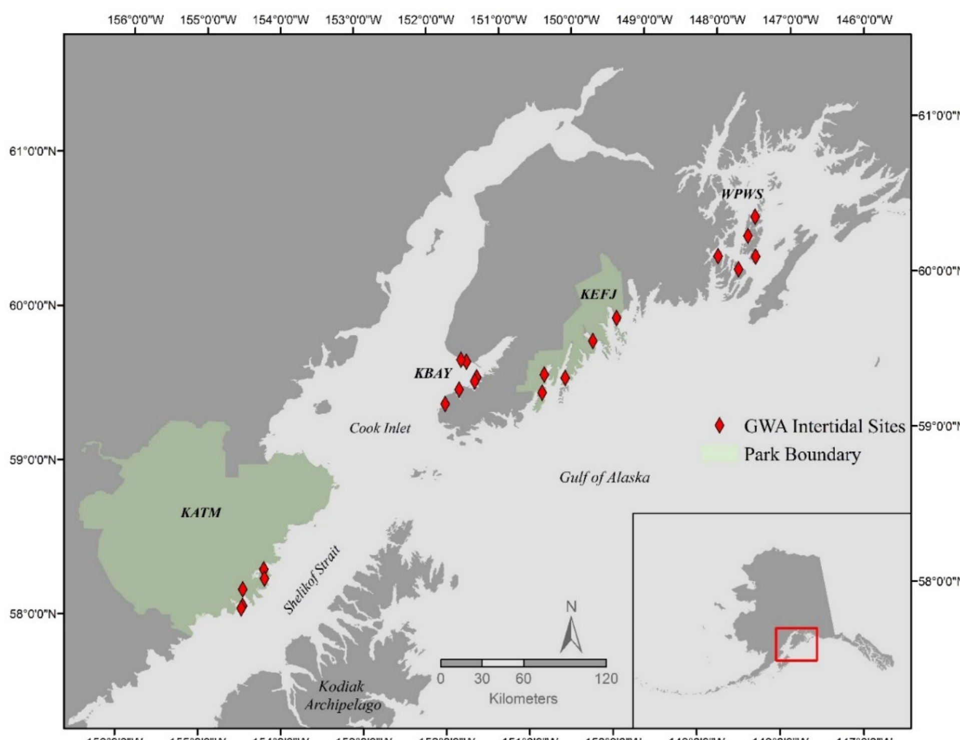

Figure 2. Map showing study sites within Katmai National Park and Preserve (KATM), Kachemak Bay (KBAY), Kenai Fjords National Park (KEFJ), and Western Prince William Sound (WPWS). The red diamonds represent rocky intertidal sites that act as a central point to established monitoring sites or transects of several other marine nearshore metrics.

Harnessing the power of long-term datasets, the first years of the GWA Nearshore Component were combined with preceding time series, extending back in time to the mid-20th century, totaling over 50 years for some data streams. Building on this legacy has resulted in important insights and management-relevant findings. As an example, data on sea otter population dynamics have revealed that patterns of changes in abundance differ among regions. Changes in sea otter populations are driven largely by local conditions, although drivers may vary (e.g., recovery from the EVOS in PWS, recolonization following fur harvest in Katmai and Kachemak Bay, and prey availability in Kenai Fjords) (Coletti et al. 2016) (Figure 3). As another example, data on rocky intertidal communities indicate that static physical attributes did not differ markedly across regions and neither did intertidal biota, indicating that our design is well-suited to document temporal variation and whether it is synchronous across regions (Konar et al. 2016).

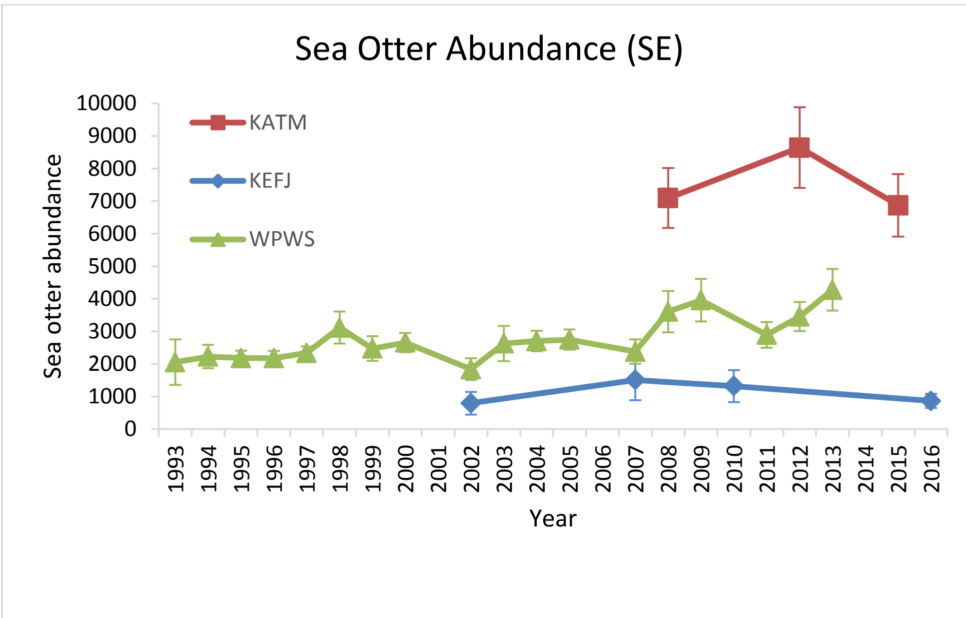

Figure 3. Sea otter abundance in KATM, KEFJ and WPWS. Error bars indicate SE.

In mussel beds across the GOA, we found similar temporal patterns in several measures of abundance, in which abundance was initially high, declined significantly over several years, and subsequently recovered. These findings suggest that factors operating across the northern GOA were affecting mussel survival and subsequently abundance. In contrast, density of primarily small mussels obtained from cores (as an index of settlement), varied markedly by site, but did not show meaningful temporal trends. We interpret this to indicate that settlement was driven by site-specific features rather than Gulf-wide factors. By extension, we hypothesize that temporal changes observed in mussel abundance were not a result of temporal variation in larval supply leading to variation in recruitment or settlement, but rather suggest mortality as a primary demographic factor driving mussel abundance (Bodkin et al. 2017). We also led an effort to compare mussel size-frequency distribution across the four regions (Iken et al. 2017, poster presentation). In a regional comparison (several sites averaged within a region), the overall size-frequency distribution patterns of mussels were relatively similar (PERMANOVA $p=0.075$; Fig. 4). Most mussels were ≤5 mm in size, followed by slowly declining numbers at larger sizes. In all years, KBAY had the highest proportion of newly settled mussels (≤5 mm), except for 2014, when KEFJ had the highest abundance of small mussels, with 67% of the mussels being ≤5 mm. In all years, abundance of newly settled mussels was always lowest in WPWS (<20%). KATM had generally the largest occurrence of larger mussels (>30 mm) of all regions in all years. However, there were significant differences in mussel size distribution among years (PERMANOVA p=0.025). Across regions, the proportion of mussels ≤5 mm was highest in 2014, except in WPWS. This strong settlement cohort was particularly evident in subsequent years at KEFJ and KATM.

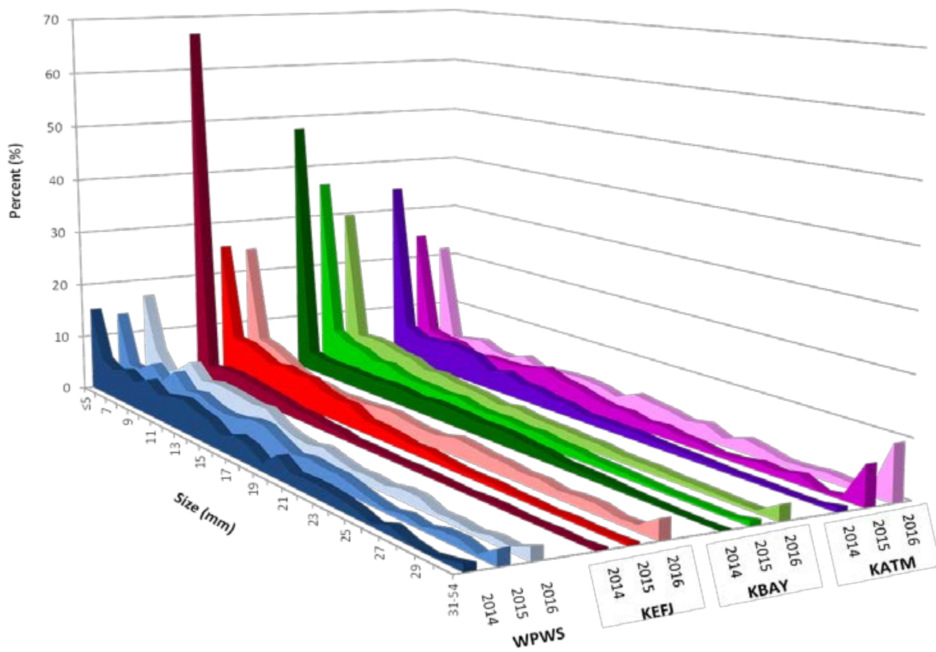

Figure 4. Mussel size-frequency distributions in four regions in the Gulf of Alaska (WPWS, KEFJ, KBAY, and KATM) over three years (2014-2016). Data from several sites per region were averaged. Size groups ≤5 mm and >30 mm were grouped.

Skiff-based marine bird and mammal surveys along coastal (nearshore) transects have been conducted annually in KATM since 2006 (with the exception of 2011) and annually in KEFJ since 2007. During the summer of 2015, we observed large increases in common murres relative to previous years. This increase was particularly evident in KATM. KEFJ does have common murre colonies; however, we observed an increase of these birds moving into coastal areas not associated with colonies. Our documentation of unusual murre distributions corresponded to observations of large die-offs of murres throughout the north Pacific in winter of 2015-2016. We speculate that high water temperature may have disrupted prey abundance or availability, leading to changes in murre distribution, behavior, condition, and mortality rates. Our results contributed to observations across GWA components that demonstrated 2015 was an anomalous year (Coletti et al. 2017).

2017 marked the first year of a fully integrated Nearshore Component project of GWA. Across all four regions of the Nearshore Component (KBAY, KATM, KEFJ and WPWS) we dug clams, counted mussels and limpets (along with a plethora of other intertidal invertebrates), estimated percent cover of a variety of algal species, monitored eelgrass beds and collected sea otter foraging data. We also conducted coastal surveys for marine birds and mammals in the parks (KATM and KEFJ) and surveyed for nesting black oystercatchers in the parks and WPWS.

Preliminary observations to date include low sea star densities across all four regions. This may be due to the incidence of sea star wasting disease documented in the GOA. Surveys for the disease began in 2014 and incidence of disease has been documented in three of the four regions including WPWS, KBAY and KEFJ. Because the design of the monitoring program is based on the nearshore food web, we may see ramifications of sea star declines on other species such as possible increases in mussels and small bivalves.

Bird surveys conducted in the parks indicated that common murre distributions have returned to pre die-off states. In the summer season, many should be on the colonies nesting; however, during the die-off, common murres were seen in protected bays near the shorelines. This year (2017), we observed nesting seabirds on colonies in both parks. We will analyze our survey data as well as work with USFWS and PWSSC to provide further updates as to the status of these seabirds in the GOA.

In collaboration with NPS, during the recent nearshore monitoring trip on the Katmai coast, the GWA nearshore program tested the use of a small Unmanned Aircraft System (UAS) to map intertidal sites. The elevation data collected by the UAS will allow us to track changes in topography over time, and enable us to correlate species presence and abundance with elevation in the intertidal zone. The high-resolution elevation data may also be critical for future assessments of ecosystem change due to sea-level rise, earthquakes, or other natural phenomena. Annual collection of UAS based aerial imagery for each site would allow documentation of physical disturbances, which would be valuable when trying to interpret high-frequency variation in community structure within sites (Figure 5). Two sites were mapped along the Katmai coast in 2017, one on Takli Island (shown below) and one in Kaflia Bay. These two sites differ in their topography and should provide an interesting comparison between a topographically complex site versus a less convoluted one.

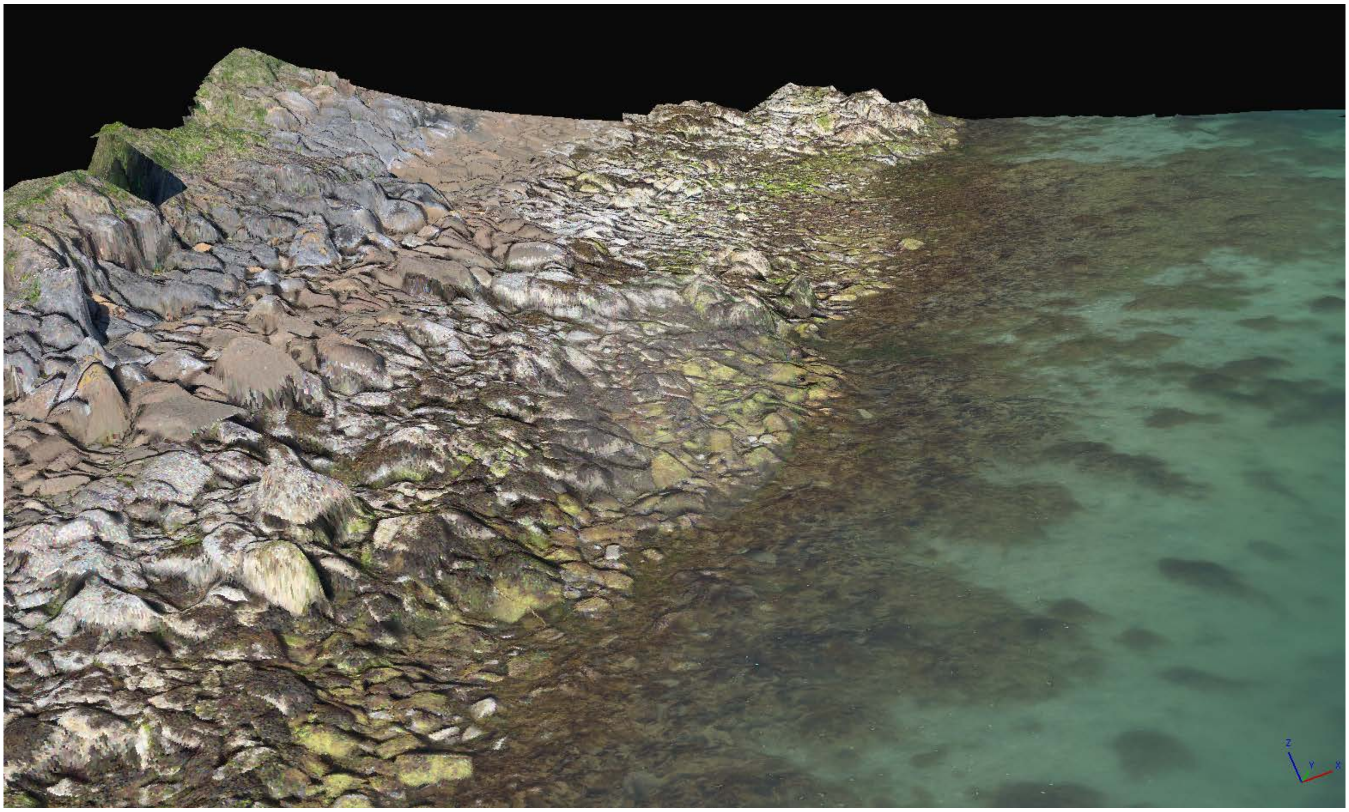

Figure 5. This 3-dimensional view of the Takli rocky intertidal site was produced from preliminary processing of aerial photographs collected from a UAS during recent nearshore monitoring field activities in KATM.

Our FY 2018 goals for the nearshore long-term monitoring program are to continue to document the status of the nearshore system by continuing time series, some of which date more than five decades, and many that were initiated soon after the 1989 spill. This information will be synthesized with other components of GWA in order to identify potential causes of change, including those related to EVOS. We will continue to use existing and new information to address our overarching hypotheses and to communicate those findings to the public, resource managers, and communities across the GOA. We are not proposing any major changes to this project for FY18.

2. COORDINATION AND COLLABORATION

A. Within an EVOSTC-funded Program

<u>*Gulf Watch Alaska*</u>

The Nearshore Component of GWA is a highly coordinated effort involving multiple PIs with expertise on various aspects of nearshore ecosystems; the overall design and coordination are critical for drawing inference about factors affecting the nearshore. Beginning in 2012 under GWA, there were two nearshore projects (15120114-R Nearshore Benthic Systems in the GOA and 12120114-L, Ecological Trends in Kachemak Bay). The two projects have worked closely over the past several years to ensure that data from all sites are comparable when possible, allowing the strongest possible inferences about the causative factors and spatial extent of changes in nearshore systems. For example, data sets were combined across projects for analyses which were published in a peer reviewed journal (Konar et al. 2016). In 2017, the two nearshore projects integrated into a single, coordinated program. We anticipate this will enhance collaboration across the GWA in the nearshore. In fall of 2017, the Nearshore Component is hosting a meeting to develop priorities for publications and products for the 2018 calendar year and beyond. This meeting likely will become an annual event for the Nearshore Component.

An educational collaboration also exists within this project. There are two University of Alaska field courses that are taught by Konar and Iken at the Kasitsna Bay Lab that assist with data collection for this program. Students get valuable experience and training from participating in the project, and the project benefits from having these students. In addition, the KBAY portion of this project provides summer funding for one graduate student who can dedicate more time to assist in the sampling, sample processing and outreach.

We have worked closely with the other GWA components (Environmental Drivers and Pelagic) over the previous five years to identify data sets that can be shared. For example, Environmental Drivers data were used extensively in an analysis of mussel trends across the Gulf of Alaska, presented in the GWA Science Synthesis report (Monson et al. 2015). For the next five years (2017-2021), we will explore the spatial and temporal variation in productivity across the nearshore and linkages to physical oceanographic processes. It will be a priority to evaluate whether changes in nearshore systems correlate with oceanographic conditions or with synchronous changes in pelagic species and conditions. The geographic scale of our study (GOA-wide) will provide greater ability to discern both potential linkages across these diverse components, as well as among the study areas within the nearshore, allowing us to evaluate variability and relations among the nearshore resources. We will incorporate data on annual and seasonal patterns measured both in the Environmental Drivers and Pelagic components of the overall GWA study.

Two components of the overall GWA program of particular importance to the nearshore is surveys of nearshore marine birds, conducted in PWS through the Summer (17120114-M) and Fall-Winter (18120114-

E) Marine Bird Population Trends monitoring component (representing additional long-term data sets; see Irons et al. 2000, Stocking et al. in press); comparable surveys are also conducted at KEFJ and KATM by the NPS SWAN program. Contrasting the changes occurring in the pelagic and nearshore environments during the recent years when GOA waters have warmed by several degrees in 2014 and 2015 (https://alaskapacificblob.wordpress.com/2016/02/09/subsurface-warmth-persists/) may be particularly illuminating.

Lingering Oil

The Nearshore Component of GWA historically has been closely linked with the Lingering Oil component, given that lingering oil occurs in nearshore habitats and affects nearshore species. Although the EVOSTC has indicated that Lingering Oil will be treated as a separate program in the current 5-year period, the conceptual and collaborative linkages remain. Data collected by the Nearshore Component are relevant for understanding ecosystem recovery with respect to the Lingering Oil Program; for example, sea otter abundance, energy recovery rate, and age-at-death data have been used to evaluate population recovery to this point (Bodkin et al. 2014, Ballachey et al. 2014).

Data Management

This project coordinates with the data management program by submitting data and preparing metadata for publication on the Gulf of Alaska Data Portal and DataONE within the timeframes required.

B. With Other EVOSTC-funded Projects

This project will coordinate with other EVOSTC-funded projects as appropriate by providing data, discussing the relevance and interpretation of data, and collaborating on reports and publications.

C. With Trustee or Management Agencies

In addition to the logistical, administrative, and in-kind support that the NPS, USGS, NOAA and University of Alaska Fairbanks (UAF) have provided to ensure the success of the GWA Nearshore Component, there are several additional projects with trustee and management agencies that the Nearshore Component of GWA has collaborated with. Below are several recent examples. We expect to continue these kinds of related projects.

NPS sea otters in KEFJ

In 2013, building on GWA findings indicating that sea otters in KEFJ consume mussels at much higher frequencies than at other areas, we initiated a study of annual patterns in mussel energetics and sea otter foraging at KEFJ, funded by NPS and USGS. The field portion of the study was completed in 2016. Lab analyses are on-going. Initial results indicate that mussel energy density varies seasonally, likely corresponding to spawning condition. Further, we found that mussel consumption by otters varied slightly seasonally in association with varying mussel energy density, but overall mussel consumption was high in KEFJ across seasons.

NPRB sea otter study

Our GWA nearshore data from KATM contributed to USGS and North Pacific Research Board (NPRB) studies of the status of the southwest Alaska stock of sea otters, which is listed as threatened under the Marine Mammal Protection Act. These data are shared with the USFWS, Marine Mammals Management, who is responsible for sea otter management. NPRB Project 717 Final Report, Estes, Bodkin and Tinker 2010.

NPS Changing Tides

Nearshore GWA PIs (Ballachey, Bodkin, Coletti, and Esler) are working with NPS on the 'Changing Tides' Project. This study examines the linkages between terrestrial and marine ecosystems and is funded by the National Park Foundation. Field work was initiated in July 2015 with in-kind support from our KATM vessel charter. National Parks in Southwest Alaska are facing a myriad of management concerns that were previously unknown for these remote coasts, including increasing visitation, expanded commercial and industrial development, and environmental changes due to natural and anthropogenic forces. These are concerns because of their potential to significantly degrade and potentially impair resources in coastal systems. The project has three key components: (1) brown bear fitness and use of marine resources, (2) health of bivalves (clams and mussels), and (3) an integrated outreach program. We (GWA Nearshore Component) assisted with the collection of a variety of bivalve species from the coast of KATM. Several specimens were kept live in small aquarium-like containers, and condition and performance metrics were assessed in the laboratory by ASLC collaborators Tuula Hollmen and Katrina Counihan. Others are being used to perform genetic transcription diagnostics (gene expression) to measure the physiologic responses of individuals to stressors, in collaboration with Liz Bowen and Keith Miles of USGS (Bowen et al. In review). This project will increase our understanding of how various stressors may affect both marine intertidal invertebrates and bear populations at multiple spatial and temporal scales. Additional work examining the interaction between bears and marine mammals was added in 2016 (initiated by Monson). Previously, it was generally believed that bears likely utilize marine mammals via scavenging of beached carcasses. This component will shed light on the importance of marine mammals (primarily sea otters and harbor seals) as live prey taken on offshore islands along the Katmai coast.

BOEM Nearshore community assessments

Nearshore Component PIs (Coletti, Iken, Konar and Lindeberg) have been working on the development of recommendations to the Bureau of Ocean Energy Management (BOEM) for nearshore community assessment and long-term monitoring. The BOEM Proposed Final Outer Continental Shelf (OCS) Oil and Gas Leasing Program 2012-2017 includes proposed Lease Sale 244 in the Cook Inlet Planning Area in 2017. An OCS Cook Inlet Lease Sale National Environmental Policy Act (NEPA) analysis has not been undertaken since 2003. Updated information is needed to support an analysis associated with the planned lease sale. The overall objective of this study is to provide data on habitats and sensitive species to support environmental analyses for NEPA documents, potential future Exploration Plans, and Development and Production Plans. The goal was to utilize existing protocols already developed thorough GWA when possible to ensure data comparability. The project will be ongoing through 2019 and all data are being provided to the Alaska Ocean Observing System data portal.

CMI Nearshore food webs in Cook Inlet

Funded through the Coastal Marine Institute (CMI), a partnership between BOEM and UAF, GWA PIs Iken and Konar are working with a student on analyzing food web structure in western Cook Inlet (above-mentioned BOEM project) and at GWA sites in Kachemak Bay. This adds valuable information about the energetic links among the species that are analyzed for their abundance and distribution through GWA.

Drones to collect monitoring data in Kachemak Bay

Nearshore GWA PIs (Iken and Konar) tested the use of unmanned aerial vehicles for various aspects of coastal biological monitoring in KBAY. With BOEM funding, drones were compared to traditional methods of rocky intertidal and seagrass sampling with some success and suggestions for future work (Konar and Iken, in press). After this success, drones were tested to determine their feasibility to complete sea otter foraging observations in KBAY with USGS funding (Monson and Weitzman).

The Pacific nearshore project

In kind support from GWA and NPS was provided to the Pacific Nearshore Project (https://pubs.usgs.gov/fs/2010/3099/) that investigated methods to asses overall health of nearshore ecosystems across the north Pacific. In particular, samples were collected during GWA trips to KATM and WPWS to examine the sources of primary productivity to two fish species that differed in their feeding mode (kelp greenling/nearshore benthic vs. black rockfish/pelagic). Stable isotope analyses showed that both benthic foraging and pelagic foraging fish species derive their energy from a combination of macro- (kelps) and micro-algae (phytoplankton) sources (von Biela 2016a). Initial stable isotope analyses from across the GOA of a variety of nearshore invertebrates supports the concept that kelps are a primary contributor of carbon to nearshore ecosystems in the GOA (unpublished data). Further work was completed by von Biela et al. (2016b), with support from GWA, examining the role of local and basin-wide ocean conditions on growth rates of benthic foraging and pelagic foraging fish species.

3. PROJECT DESIGN – PLAN FOR FY18

A. Objectives for FY18

The fundamental objective of this work is the continued long-term monitoring of a suite of nearshore species at multiple locations across the Gulf of Alaska, with an overall goal of understanding drivers of variation in the Gulf of Alaska (GOA) nearshore ecosystem and understanding pathways to recovery of EVOS affected resources.

The specific objectives for the period of 2018 include:

1. To determine status and detect patterns of change and variation in a suite of nearshore species and communities.
2. Identify temporal and spatial extent of observed changes and variation.
3. Identify potential causes of change or variation in biological communities.
4. Communicate results to the public and to resource managers to preserve nearshore resources.
5. Continue restoration monitoring in the nearshore in order to evaluate the current status of injured resources in oiled areas and identify factors potentially affecting present and future trends in population status.

B. Changes to Project Design

No changes have been made to the project design.

4. SCHEDULE

A. Project Milestones for FY18

Deliverable/Milestone	***Status***
Field Work (multiple trips, multiple tasks per trip to collect data on series of nearshore metrics); KATM, KEFJ, WPWS, KBAY	Completed, March - July, Annually

Deliverable/Milestone	***Status***
Upload Data To Project Website	To be Completed 1 Year After Collection
PI's Attend Annual Program Meeting	To be Completed Annually
Meet All Program Reporting Requirements	To be Completed Annually

B. Measurable Project Tasks for FY18

Tasks associated with the Nearshore project include the following:

1. Annual Collection of sea otter skulls for determination of age-at-death.
2. Annual collection of sea otter diet and energy recovery rate data.
3. Aerial surveys of sea otter abundance.
4. Sampling of intertidal invertebrates and algae.
5. Sampling of sea grasses.
6. Sampling diet and productivity of black oystercatchers.
7. Sampling marine bird and mammal density (summer).
8. Sampling marine bird and mammal density (winter).
9. Stable isotope analysis of selected nearshore species.
10. Contaminant sample collection
11. All reporting

FY 2018 (Year 7)

FY18, 1st quarter (February 1, 2018 - April 30, 2018)
*Submit year 1 annual reports (**Mar. 1**)*
PI data compliance – prior year available to public

Field work includes collection of sea otter skulls for age-at-death determination during April in PWS and winter (March) marine bird and mammal surveys in KATM, depending on NPS priority (NPS funded)

Continue to prepare for upcoming field season (all logistics including staff, timing, equipment, vessel contracts and travel)

FY18, 2nd quarter (May 1, 2018 - July 31, 2018)
All field tasks initiated and completed in all four regions (KBAY, KATM, KEFJ and WPWS) (May, June and July)

KATM sea otter aerial survey (July)
Samples collected for contaminant analyses in all regions

FY18, 3rd quarter (August 1, 2018 - October 31, 2018)
*Annual workplan completed (**Aug. 23**)*
Datasets from current year posted on the internal Ocean Workspace

FY18, 4th quarter (November 1, 2018 - January 31, 2019)

Analysis continues along with preparation for a nearshore specific meeting in October, the annual GWA meeting in Nov. and for Alaska Marine Science Symposium in January

Begin annual report, summarize annual results including outreach as well as publications

5. PROJECT PERSONNEL – CHANGES AND UPDATES

We anticipate that A. Doroff (KBRR) and G. Esslinger (USGS), with support from M. Lindeberg (NOAA), A. Miller (NPS) and other USGS and NPS scientific staff, will continue the data collection and sampling across all four regions. This team of scientists has an extensive background of research efforts in coastal marine areas of Alaska.

We anticipate a team approach to the overall field work effort, with shared personnel across areas wherever possible, to ensure consistency of data collection and enhance our understanding of comparisons and contrasts across areas. We will attend an annual meeting of the larger group of scientists involved in the overall long-term monitoring; but also expect that we will continue to work closely together as a sub-group and to meet less formally as required throughout each year.

6. BUDGET

A. Budget Forms (See GWA FY18 Budget Workbook)

Please see project budget forms compiled for the program.

B. Changes from Original Proposal

No changes to the overall Nearshore budget have been made; however, a few items have been re-allocated within the project. For FY18 - FY21, the $6,000.00 allocated to USGS (Coletti and Esler) for stable isotope analyses have been moved to UAF (Konar and Iken). UAF has the capacity to manage and analyze the samples for the nearshore project as a whole. Salary support to collect sea otter foraging observations in KBAY has been moved from Konar and Iken to Coletti and Esler (FY18 5.7k, FY19 5.8k, FY20 6.0K and FY21 6.1k). This will ensure the continued integration of the nearshore project.

C. Sources of Additional Funding

Annual in-kind contributions consist of staff time (USGS = $92K; NPS = $130k; NOAA = $10k), reduced charter costs (USGS = $45K; NPS= $25K), winter bird surveys (NPS=$18K through 2019), use of equipment such as rigid-hull inflatable, inflatables/outboards, GPSs, spotting scopes, field laptops, sounding equipment (USGS = $40K; NPS = $40K) and commodities (USGS = $5k; NPS = $5K).

7. RECENT PUBLICATIONS AND PRODUCTS

Publications

Bodkin, J.L., H.A. Coletti, B.E. Ballachey, D. Monson, D. Esler, and T.A. Dean. 2017. Spatial and temporal variation in Pacific blue mussel, Mytilus trossulus, abundance in the northern Gulf of Alaska, 2006-2015. Deep Sea Research Part II: Topical Studies in Oceanography, Spatial and temporal ecological variability in the northern Gulf of Alaska: what have we learned since the *Exxon Valdez* oil spill?

Bodkin, J.L., B.E. Ballachey, G.E. Esslinger, B.P. Weitzman, A.M. Burdin, L. Nichol and H.A. Coletti. 2017. A century of sea otter science and conservation in National Parks. X Sea Otter Conservation Workshop, 17-19 March 2017, Seattle Aquarium. Seattle WA.

Bowen, L., A.K. Miles, B.E. Ballachey, S. Waters, J.L. Bodkin, M. Lindeberg, and D. Esler. 2017. Gene transcription patterns in response to low level petroleum contaminants in Mytilus trossulus from field sites and harbors in southcentral Alaska. Deep Sea Research Part II: Topical Studies in Oceanography, Spatial and temporal ecological variability in the northern Gulf of Alaska: what have we learned since the *Exxon Valdez* oil spill? In press

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