

I. EVOSTC FY17-FY21 INVITATION FOR PROPOSALS
II. FY19 CONTINUING PROGRAM PROPOSAL SUMMARY PAGE

Proposals requesting FY19 funding are due to shihway.wang@alaska.gov and elise.hsieh@alaska.gov by August 25, 2018. 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.

Program Number and Title

19120113 Data Management Program

Primary Investigator(s) and Affiliation(s)

Carol Janzen, Alaska Ocean Observing System

Date Proposal Submitted

20 August 2018

Program Abstract

The *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) requires a data management program composed of tools covering the entire data lifecycle, from immediately after data collection, to long-term preservation, to discovery and reuse. During the last EVOSTC five-year funding cycle, the Alaska Ocean Observing System (AOOS) provided data management services for both the “Long-Term Monitoring of Marine Conditions and Injured Resources and Services” Program, referred to as Gulf Watch Alaska (GWA), and the “Herring Research and Monitoring” (HRM) Program. These two programs leveraged the existing data management capacity of AOOS, and have also helped inform and improve the overall AOOS data and metadata management, access, and visualization tools. Because of these past investments, the AOOS team and infrastructure are best situated to provide data services to the EVOSTC for the next five years and thus maintain continuity and build upon the ongoing efforts and data management system development. Through these efforts, AOOS will continue to provide access to these tools and services for which the principal investigators (PIs) of the GWA and HRM Programs depend. Among these, the Research Workspace (an enhanced version of the former web-based data management platform, the Ocean Workspace) will be maintained and supported to upload, organize, and document data, as well as to facilitate program administration. This platform is familiar to GWA and HRM PIs from the prior funded effort and allows data to be made promptly and securely available to team members and program administrators. During the spring of 2016, the existing Ocean Workspace was updated with an enhanced metadata editor designed to help researchers more easily generate flexible yet robust, standards-compliant metadata. As in previous years, GWA and HRM Program data will be shared publicly (or ‘published’) through the AOOS Gulf of Alaska Data Portal, where it can be accompanied by any supplemental files or project documentation. Publishing through AOOS makes the data available to a wide-ranging and established network of resource managers, scientists, and the general public to support decision-making. In addition, the GWA and HRM Program datasets will be ingested into DataONE for long-term preservation, where each dataset will be assigned a digital object identifier (DOI) and made discoverable through other DataONE nodes. Through the AOOS data management system, the significant expertise of the data management staff at its technical partner organization, Axiom Data Science, is leveraged. The Axiom staff have extensive experience with the GWA and HRM Programs and their associated data through the prior five-year effort. Building upon these established relationships and infrastructure, AOOS is well-poised to deliver continued success in its data management services to facilitate the access and curation of data to support decision-making related to Spill affected ecosystems.

**The abstract should provide a brief overview of the overall goals and hypotheses of the project and provide sufficient information for a summary review as this is the text that will be used in the public work plan and may be relied upon by the PAC and other parties.*

EVOSTC Funding Requested* (must include 9% GA)					
FY17	FY18	FY19	FY20	FY21	TOTAL
\$218,00	\$218,00	\$218,000	\$218,000	\$218,000	\$1,090,000

Non-EVOSTC Funds to be used, please include source and amount per source: Source AOOS					
FY17	FY18	FY19	FY20	FY21	TOTAL
\$2,705	\$2,786	\$2,869	\$2,955	\$3,044	\$14,359

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

1. EXECUTIVE SUMMARY

Provide a summary of the program including key hypotheses and overall goals, as submitted in your original proposal. Please include a summary and highlights from your FY18 work: preliminary results with figures and tables. If there are no preliminary results to present, please explain why (i.e., lab analysis is still in progress). List any publications that have been submitted and/or accepted since you submitted your last proposal and other products in *Section 7*. FY17 Annual Reports will be included with this proposal for review.

Following the 1989 *Exxon Valdez* oil spill (“Spill”), several decades of scientific research has occurred to monitor the impacts and recovery to the Gulf of Alaska region and its resources. Over time, ecosystem impacts directly related to the Spill have become more challenging to detect due to regime shifts, natural variability, climate change, and other anthropogenic changes. Data collected through long-term observations and focused research is fundamental to inform management decision-making by determining whether changes are related to natural or Spill-related factors, and by identifying what potential recovery actions may be needed. To address these challenges and facilitate the recovery of injured resources, scientific and resource management communities need access to the most current scientific information and environmental intelligence tools to help make sound decisions.

In 2012, EVOSTC awarded the Alaska Ocean Observing System (AOOS) a data management contract entitled “Collaborative Data Management and Holistic Synthesis of Impacts and Recovery Status Associated with the *Exxon Valdez* Oil Spill”. In that project, AOOS and its partners successfully designed, developed, and maintained an interactive web-based data management system to support the data management needs of the GWA and HRM Programs and the EVOSTC. AOOS and data team partner Axiom Data Science continue to provide the data management for both the GWA and HRM Programs for the next phase of the impact studies during the period 2016-2021, but is no longer an imbedded project within GWA.

This proposed work plan for Year 3 of the 5-year program responds to the EVOSTC’s continued need for a cost-effective data management program that also maintains continuity and builds upon the efforts of the prior contract. AOOS and its technical partner, Axiom Data Science, are best situated to provide that continuity by leveraging the data management system already instituted for the GWA and HRM Programs since 2012. In this proposed work, this system will be maintained and augmented to enhance the accessibility of GWA and HRM data and products to ensure they are readily available to the general science and natural resource management communities, both now and into the future.

The goal of the data management program is to provide critical data management. It supports the GWA and HRM investigators and program leads in order to assist study teams in efficiently meeting their objectives and

ensuring data collected or consolidated through the effort is organized, documented, and available for their use and for future use by the larger scientific community. We continue to be successful in meeting the goal of this project under a reduced budget by leveraging the extensive cyberinfrastructure and data management capacities of both Axiom and AOOS, and utilizing the existing, collaborative relationships with program PIs to ensure continuity in the data collected across efforts.

This program prioritizes data preservation and accessibility to scientific and resource management communities. This is achieved through support for data submission and organization, metadata generation, and data transfer among study teams. Axiom data analysts and domain experts will continue to review metadata and data structure formats produced from GWA and HRM data collection activities and advise study team members in best practices for short-term and long-term data formats, as well as metadata authoring. Axiom software engineers continue to enhance existing web-based tools to improve the discoverability of GWA and HRM project-level data, which includes the ability to search and filter EVOS-funded datasets by space, time, parameter and taxonomy, both privately within the project and externally after the data have been shared with the public. This data curation process has been designed to meet the requirements of the EVOSTC as specified in the Data Management Program Invitation, which also includes the transfer of GWA and HRM Program data to the EVOSTC storage resources at the completion of this funding term.

FY18 Highlights:

FY 18, 1st quarter (February 1, 2018 - April 31, 2018)

April 30, 2018: Schedule & complete data management meetings with individual PIs

April 30, 2018: Modify Workspace metadata to connect time series data sets

Ongoing: Publish data and data products through the AOOS Gulf of Alaska data portal

Delayed until August 2018: Final data collections (from lagged 2016 datasets) submitted to DataONE

April 4, 2018: Present data management procedures & progress at spring PMT meeting, including notification to PIs re: metadata and data submission deadlines

Ongoing: Provide ongoing data and metadata support to PIs

March 1, 2018: Submit annual report to EVOSTC

FY 18, 2nd quarter (May 1, 2018-July 31, 2018)

July 31, 2018: Hold one-on-one meetings with PIs on data progress (ongoing as needed)

June 30, 2018: Revise data management plans to respond to project-level changes

June 30, 2018: Conduct semi-annual review of data submissions

May 1, 2018: Notification to PIs re: metadata & data submission deadline

Ongoing: Provide maintenance on data management system

Ongoing: Provide ongoing data and metadata support to project PIs, as needed

Project investigators continued to provide core data management oversight and services for the Gulf Watch Alaska (GWA) and Herring Research and Monitoring (HRM) programs and all but one milestones have been met for this reporting period. The data management team maintained communications with PIs following the one-on-one data scoping meetings held with individual PIs from both the GWA and the HRM Programs at the November 2017 annual meeting. From these meetings, data management plans (DMPs) for the GWA and HRM Programs were established during this reporting period, each of which detailed how data for individually-funded projects would be handled throughout that program's lifecycle, from data collection to preservation. Using this information, an inventory of data expected to be generated by EVOS GWA and HRM sampling efforts was created. This inventory describes the datasets, indicates the investigator responsible for the data, and notes the status of data and metadata for each project. The updated dataset status for each project during this reporting period is summarized in Table A. (Objectives 1 and 3)

Table A . Inventory of GulfWatch Alaska (GWA) & Herring Research and Monitoring (HRM) data published through the Gulf of Alaska data portal and/or shared within the Research Workspace.

Program	Project	Project	2016	2017	Comments
GWA	Environmental drivers: Continuous Plankton Recorders	Plankton data	2	0	2017 zooplankton data is still being processed
		Temperature data	2	1	
GWA	Environmental drivers: Gulf of Alaska Mooring (GAK1)	CTD data	2	1	
		Mooring data	2	1	
GWA	Environmental Drivers: Oceanographic Conditions in Prince William Sound	Chlorophyll data	2	1	
		CTD data	2	1	
		Zooplankton data	2	0	2017 Zooplankton data is still being processed
GWA	Environmental Drivers: Oceanographic monitoring in Cook Inlet and Kachemak Bay	CTD data	2	1	
		KBNERR meteorological data	2	1	
		KBNERR nutrient data	2	1	
		KBNERR water quality data	2	1	
		Zooplankton data	2	0	2017 Zooplankton data is still being processed
GWA	Environmental Drivers: Seward Line	Chlorophyll data	2	1	
		CTD data	2	1	
		Nutrient data	2	1	
		Seabird data (Kuletz)	2	1	

		Zooplankton data	2	0	2017 Zooplankton data is still being processed
GWA	Nearshore: Ecological trends in Kachemak Bay	Rocky intertidal community data	2	1	
		Mussel data	2	1	
		Rocky intertidal data	2	1	
		Substrate data	2	1	
		Sea otter data	2	n/a	
		Seagrass data	2	1	
		Temperature data	2	0	
GWA	Nearshore: Intertidal Systems in Gulf of Alaska	Oystercatcher diet & nest density data	2	1	
		Eelgrass data	2	1	
		Invertebrate and algae data	2	1	
		Marine birds and mammals data	2	1	
		Water quality data	2	1	
		Sea otter data	2	1	
GWA	Pelagic: Fall and Winter seabird abundance	Seabird survey data	2	1	
GWA	Pelagic: Forage fish distribution, abundance, and body condition	Aerial survey data	2	n/a	
		Forage fish morph & count data	2	1	
		Marine predator survey data	2	1	
		Water chemistry (CTD & nutrients) data	2	1	

		Zooplankton data	2	1	
GWA	Pelagic: Humpback whale predation on herring	Fluke id catalog	2	2	
		Energetic/stable isotope data	2	0	2017 data is still being processed
		Whale survey data	2	n/a	surveys began in fall 2017
GWA	Pelagic: Long-term killer whale monitoring	Acoustic catalog	2	1	
		Photo catalog	2	1	
		Satellite tagging and biopsy data	2	0	
		Prey sampling	0.5	0	data collected in 2016, still being analyzed
		Orca database	2	0	
GWA	Pelagic: Prince William Sound Marine Birds	Summer bird survey data	2	1	
Herring	Acoustic surveys of juvenile herring abundance	raw acoustic data	2	n/a	
		processed acoustic data	2	n/a	
		biomass summary	2	n/a	
Herring	ADFG Surveys: aerial survey, biomass age sex length, spawn	aerial biomass observation & routes data	2	1	
		aerial survey marine bird & mammal observations data	2	1	
		ASL data	2	1	
		herring acoustics data	2	1	
Herring	Adult acoustic biomass surveys	raw acoustic data	2	1	
		processed acoustic data	2	1	

		biomass summary	2	1	
Herring	Aerial surveys of juvenile herring	raw survey data	2	2	
		age 1 index	2	1	
Herring	Herring disease program	prevalence summary	2	0	
		raw lab data	2	P	
Herring	Modeling herring population dynamics in Prince William Sound	age composition	2	1	
		model codebase	2	1	
		output data	2	1	
Herring	Age at Maturity	histology database	n/a	1	new project 2017
Herring	Annual herring migration	collected fish data	n/a	P	new project 2017

Key: "2" : Obligation to publish data has been met; "1" : Obligation to share data to Workspace has been met; "0.5" : Obligation to share data has been partially met; "0" : No data from this season was shared for the project; "n/a" : The project was not funded during this season; "P": process study with data not expected until end of project.

To help PIs efficiently author robust metadata to describe their respective datasets, metadata templates were created in the previous year with standardized information for fields that must contain program-wide metadata (e.g. access constraints, use constraints, and programmatic contact information). These templates are intended to make metadata creation less cumbersome for PIs by using a real-time process that occurs in concert with data collection and analysis. These templates can now be found within the Workspace [here](#) and were being implemented during this reporting period. (Objective 3)

To assist PIs in proficiently and efficiently using the Workspace, Axiom staff provided training via workshops and support through email and in-person meetings. Three members of data management team, Carol Janzen, Stacey Buckelew, and Chris Turner, attended the GWA program meeting in January 2018 at the Alaska Marine Science Symposium, the spring Program Management Team teleconference April 4, 2018 and the Summer PI teleconference July 9, 2018. The data management team gave two separate presentations focused on use of the Research Workspace and its metadata editor, and an update to the DataONE archive process. Further, Axiom developed and hosted a half-day workshop at the January 2018 Alaska Marine Science Symposium entitled Metadata 411. This workshop was held to help PIs gain a practical understanding of the information that makes up a metadata record while practicing using the Research Workspace Metadata Editor. Additionally, Axiom hosted two 3-hour metadata “office hour” sessions at the conference. In these sessions Axiom was present at the Captain Cook Hotel to respond to any metadata-related questions the attending PIs had (12 attendees), or provide them with one-on-one assistance relative to their project datasets. (Objective 3)

The data management team worked with GWA and HRM program PIs to finalize and publish any remaining lagged datasets from the prior funding effort. These are datasets that had a longer processing time. In FY17, all

outstanding 2012-2016 datasets were finalized, with content added to the Research Workspace and made available to through the Gulf of Alaska Data Portal. These finalized datasets were audited and prepared into archive-ready data packages within the Research Workspace. These final years of data will be appended to the existing archived data packages in the DataONE Member Node for those respective projects, including Environmental drivers: Continuous Plankton Recorders, Environmental Drivers: Seward Line, and the Adult Herring Biomass Surveys projects. The original update to the data packaged was scheduled for Q1 FY 18. However, this task is technically complex and delays were experienced between DataONE and the data management technical teams; therefore, the completion date for this task is now scheduled for mid to late August 2018 (Q3). This is the only FY18 milestone that has been delayed. (Objectives 2 and 5)

Software engineers at Axiom continue to provide support for the Workspace, resolve bugs and implement new functionality in response to user feedback. Scheduled and as-necessary maintenance to the data management system infrastructure, including the Workspace and Gulf of Alaska Data Portal, was made during this reporting period to ensure continuous operation and reliability for the GWA and HRM Program PIs. This involved tasks such as applying security updates, monitoring for hardware failures, updates to the Workspace and portal help documentation, and upgrades to improve performance and capacity. (Objective 4)

The Workspace serves as an internal file sharing and storage tool, where all data files (including the contextual information, raw data, data not currently public, etc.) are housed, and from which these data files can be made public. The Workspace contains individual PI user and group profiles in which data are submitted and shared among project collaborators. Table A (shown above) includes an up-to-date inventory of the data sharing status for each project within the Workspace for the 2017 field season. In all cases, projects are meeting or exceeding expectation for data sharing within this tool. (Objectives 4 and 6)

Project Lead Carol Janzen (AOOS) coordinated a mid-term call April 30 with GWA and HRM Program Leads to discuss any outstanding issues with data management activities. These calls are scheduled as needed, typically between the Annual meetings and spring and summer teleconferences. (Objective 6)

2. PROGRAM STATUS OF SCHEDULED ACCOMPLISHMENTS

A. Program Milestones and Tasks

Milestones are annual steps to meet overall program objectives. For each milestone listed, specify the status (completed, not completed) when each was completed and if they are on schedule, as submitted in your most current proposal.

Tasks are annual steps to meet milestones. Specify, by each quarter of each fiscal year, when critical tasks (for example, sample collection, data analysis, manuscript submittal, etc.) were and will be completed.

Please identify any substantive changes and the reason for the changes. *Reviewers will use this information in conjunction with annual program reports to assess whether the program is meeting its objectives and is suitable for continued funding.*

B. Explanation for not completing any planned milestones and tasks

Please identify any substantive changes and the reason for the changes. If tasks were not completed as scheduled or delayed, please explain why and the anticipated completion date.

C. Justification for new milestones and tasks

Please identify any new milestones and tasks and the reason why they have been added.

A. Program Milestones and Tasks

Program milestone and task progress by fiscal year and quarter, beginning February 1, 2017. Yellow highlight indicates proposed fiscal year Work Plan. Additional milestones and tasks may be added. C = completed, X = not completed or planned. Fiscal Year Quarters: 1= Feb. 1-April 30; 2= May 1-July 31; 3= Aug. 1-Oct. 31; 4= Nov. 1-Jan 31.

Milestone/Task	FY17				FY18				FY19				FY20				FY21			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OBJ 1- Initiate data management services and oversight for EVOS GWA and HRM Program data-related activities: Status - completed																				
Convene data management meeting with GWA and HRM Program leads	C				C		X													
Convene data scoping meetings with individual PIs to develop GWA and HRM data management plans (DMPs)	C	C	C																	
Develop up-to-date inventory of expected and submitted data for 5 years				C																
Complete/disseminate data management plans (DMPs) for GWA and HRM		C			C															
Institutionalize metadata authoring among program teams		C																		
Develop/disseminate metadata templates		C																		
OBJ 2 - Continue to standardize and provide access to data sets from the first five-year GWA and HRM efforts for continuity and integration – completed and ongoing as necessary																				
Set-up new GWA & HRM Workspace groups	C	C																		
Connect data and metadata to any previous data instances		C						X												
Support continued access to GWA and HRM data collected in the prior five-year effort in the former Workspace group, and, as needed, make this data also available in the new Workspace group(s)	C	C							X											
OBJ 3 - Data submissions and metadata generation: Status - on target																				
<i>Milestone: Support and provide training for data transfer and metadata production using the Workspace</i>																				
Provide Workspace and metadata training to PIs	C			C				X				X				X				
<i>Milestone: Track regular data and metadata submissions</i>																				
Maintain updated data inventory (Obj. 1, M. 3) to track data and metadata submissions to the Workspace				C		C		X		X		X		X		X		X		X

as needed																				
Maintain regular contact with PIs about data management throughout the year	C	C	C	C	C	C	X	X	X	X										
<i>Milestone: Continually evaluate progress and new technologies and management methods to keep pace with program needs</i>																				
Conduct user surveys with project PIs about data management methods, application and progress					C	C			X	X							X	X		
<i>Milestone: Report progress annually to the EVOSTC</i>																				
OBJ 7 - Verify data and metadata completeness and final transfer at the term completion – N/A, YEAR 5																				
<i>Milestone: Ensure the existence and completeness of all data in the data inventory</i>																				
Verify data and metadata completeness for GWA & HRM Programs																		X	X	X
Discuss final transfer & storage of data to EVOSTC																	X			
Implement transfer agreement																				X
Reporting																				
Progress Reports		C								X			X		x		x		x	x
Annual reports					C					X				X				X		X
Annual PI Meeting				C				X					X				X			x
FY work plan (DPD)		C	C			C	X				X	X			x	x				

OBJECTIVE 1. *Initiate data management services and oversight for EVOS GWA and HRM Program data-related activities.*

- 1. Milestone 1. Convene data management meeting with GWA and HRM Program leads*
- 2. Milestone 2. Convene data scoping meetings with individual PIs to develop GWA and HRM data management plans (DMPs)*
- 3. Milestone 3. Maintain up-to-date inventory of expected and submitted data*
- 4. Milestone 4. Institutionalize metadata authoring among program teams*

Status: All Milestones for this objective have been completed, and will be revisited as needed.

OBJECTIVE 2. *Continue to standardize and provide access to data sets from the first five-year GWA and HRM efforts for continuity and integration.*

- 1. Milestone 1. Connect data and metadata to any previous data instances*
- 2. Milestone 2. Support continued access to GWA and HRM data collected in the prior five-year effort in the former Workspace group, and, as needed, make this data also available in the new Workspace group(s)*

Status: All Milestones for this objective have been completed and will be revisited as needed.

OBJECTIVE 3. *Facilitate, monitor, and evaluate regular data submissions and metadata generation in the Workspace. GWA and HRM investigators and administrators will use the Workspace as a web-based platform for PIs to upload, share and discover data sets and supporting documents, and to rapidly author metadata. The system is enabled with security authentication in order to limit access to GWA and HRM investigators, project managers, and administrators. Throughout the life of the project, Axiom staff will maintain oversight of timely and organized data, metadata documentation, and other program documents to the Workspace using a combination of data management personnel and technical infrastructure.*

Milestone 1. Support and provide training for data transfer and metadata production using the Workspace - Experience with the use of the Ocean Workspace (now called the Research Workspace) by 15 other research programs over the past four years has resulted in a system that is intuitive, easy to use, and designed to meet researcher needs. To enhance GWA and HRM PI use of this system, Axiom will host in-person and web-based training sessions in Year 1. These trainings will be scheduled as soon as possible after funding award. Throughout the life of the program, Axiom will continue to provide training and one-on-one assistance, as needed, to support PIs and Program leads.

Milestone 2. Track regular data and metadata submissions - The data inventory (Obj. 1, M. 3 completed in FY18) will be used to track data and metadata submissions to the Workspace against data that was expected to be generated through the GWA and HRM program terms. Using the data management plans (DMPs) (Obj. 1, M. 2 completed in FY18), Axiom will audit the organization of data intended for publication by ensuring the types of data submitted are appropriate for long-term preservation and consistent conventions are used for naming files. This will be achieved by working directly with the PIs to implement any recommended changes identified during the audits. Depending on the extent of work, Axiom may develop the capability to automate these audits in the Workspace (Obj. 4, M 3); otherwise, audits will be performed manually by the data management team. In addition to the audits, file inventory reports generated by the Workspace will be used to track submission progress. Indication of data submission delays and formatting delinquencies will be identified and communicated following the procedures for addressing data non-compliance (see "Reporting Protocols" above). The corrective actions to address non-compliance will be implemented by the PIs with support from the Axiom data management team. On a semi-annual basis, the data management team will update the data inventory to reflect changes in dataset and metadata status.

Milestone 3. Hold annual data progress meetings with individual PIs - To facilitate timely data submission and metadata authoring, Axiom will continue to meet annually with each individual PI to discuss progress. Based on previous experiences including FY17 and FY18, these one-on-one meetings are the most effective way to address individual metadata authoring questions, create accountability for data submissions, and strengthen relationships between PIs and data management staff. During these meetings, data management staff revisit and make any changes necessary to the DMPs to ensure the documents are responsive to any changes or unexpected issues that arise in data collection or processing.

Milestone 4. Provide supplemental data and metadata quality control- According to the data sharing policies (see below) the PIs are to conduct quality assurance on data collection procedures and quality control the data they generate. Quality control by the data managers will be focused on data file formatting and on metadata documentation to ensure authoring adheres to known best practices and accurately reflects data captured within individual data files. This process includes an automated completeness check for required metadata fields; a secondary quality control check by Axiom data management staff for accuracy and consistency of metadata resulting in a list of any issues in the metadata that will be delivered to the PI; and a final check for ISO-format validation after metadata quality issues have been addressed and before submitting the dataset to national archives.

Data sharing policies adopted by the GWA and HRM teams are as follows (unless prohibited by partner agency):

- All data are posted on the GWA Program Workspace as they become available following collection in order to promote internal integration and sharing within the project.
- These data are replaced with QA/QC'd data when available.
- Comprehensive metadata using FGDC (or ISO) standards accompany each dataset.
- Monitoring data are made available to the public as soon as they have been QA/QC'd or within 1 year following collection, whichever is sooner.

- Anyone making public use of another team's data contacts the data collector and provides appropriate attribution and credit.
- The Science Coordinating Committee must agree to any deviations from these policies in advance.

Additionally, all PIs and project managers are expected to adhere to EVOSTC policies regarding retention of all documents, correspondence (electronic and paper), samples, and data per the terms of the EVOSTC court settlement.

OBJECTIVE 4. *Provide, maintain, and modify technical infrastructure to ensure access to information produced or processed by the GWA and HRM Programs.* The ultimate goal of this program is to provide technological and staff services to assist in the organization, documentation, and structuring of data collected by EVOS GWA and HRM activities so that it can be transferred efficiently to long-term data archive and storage centers for future use by researchers and other user groups. This program leverages cyberinfrastructure, long-term funding, and other active data management projects previously and currently undertaken by AOOS. Datasets produced from the GWA and HRM Programs will be shared with each other, documented, and shared with the public by extending and enhancing an existing technological infrastructure (see "Existing Infrastructure" above). These systems have capabilities to share, ingest, document, and archive project data and related documentation to ensure its long-term security and use.

Milestone 1. Create Research Workspaces to immediately serve the needs of GWA and HRM Programs - At the onset of this program (completed in FY17), new groups in the Research Workspace were created for the funded GWA and HRM programs. A new Workspace instance was necessary to clearly organize project-level data captured under this funded effort and to safeguard project and PI security settings across funding cycles. Throughout the course of the GWA and HRM programs, the data management team will maintain and provide technical assistance to support PIs using the Research Workspace to store project data.

Milestone 2. Develop semi-automated submission pathways to data archives - Axiom will continue to develop tools that augment the Research Workspace in order to send data to a DataONE (a nationally recognized long-term archive for scientific data) member repository for long-term preservation. The intent of these tools is to ease the ingestion of data collections to data archives by simplifying the submission and upload of content and metadata. The pathway may include automated QA steps, bulk file ingestion, and completeness checks for metadata content. Automated pathways to national or disciplinary archives outside the DataONE network may be developed based on community interest and the relevance of the content of other archive to EVOSTC data.

Milestone 3. Provide scheduled and unscheduled maintenance to the system infrastructure - Continue to provide scheduled and as-necessary maintenance to the data management system infrastructure, including the Research Workspace and Gulf of Alaska Data Portal, to ensure continuous operation and reliability for the GWA and HRM Program PIs. This may involve tasks such as applying security updates, monitoring for hardware failures, and upgrades to improve performance and capacity.

OBJECTIVE 5. *Publish and promote data collected by the HRM and GWA Programs, making it available for research, management, and general audiences.* To maximize data use for analysis, synthesis, review, and application, and to support the restoration and management of EVOS injured resource, data from the GWA and HRM programs will be made widely available through multiple pathways. During the research phase of this funding cycle, data will be securely available for internal use through the Workspace. When data is ready to be published, they will be made available through the existing, public-facing data portal (Gulf of Alaska Portal: <https://portal.aos.org/old/gulf-of-alaska>) for exploration and discovery. Simultaneously, data will be archived through DataONE, where it will be preserved over the long-term. National repositories also reach wider audiences, thus expanding the access, discoverability, and active management of data collections generated through these programs.

Milestone 1. Prepare data and metadata into preservation-ready file formats - File formats play a key role in the ability for data access and reuse in the future. As opposed to proprietary or product-specific formats, open file formats are necessary for long-term preservation and storage, particularly in data repositories. Examples of preferred formats for different types of data include: ASCII formats (TXT, CSV, XML), NetCDF, and PDF. Ultimately, it is the responsibility of the data providers to generate and document preservation-ready data formats. However, Axiom data analysts will help convert data from agreed-upon formats (used by the PIs) into preservation-ready file formats when necessary. For datasets that may stray from format standardization, Axiom data analysts will work with PIs to determine the best option for dataset preservation. Any custom scripts that are developed to convert between formats and visualize the data will be saved to streamline conversion of similar data types in the future. To ease file use and analysis by PIs that prefer proprietary or product-specific formats, the original files will be retained.

Milestone 2. Publish data and relevant program documents through the Gulf of Alaska Portal - After metadata that complies with content and quality requirements is completed, the Workspace will be used as a gateway to publish data and associated metadata to the GOA portal, which is publically-available for discovery by researchers, managers and general audiences. As data providers, PIs have ultimate control for managing which data is made publicly available. Within projects, PIs can individually elect to publish data folders to the portal using a simple, clearly marked checkbox. At the annual one-on-one meetings with PIs, Axiom will review the published data files with PIs to ensure no unintended publication occurs (e.g., if data has been published by another project collaborator before it is finalized).

Milestone 3. Submit all final data and metadata documents to a national archive - By the end of the proposed five-year term, all final data and metadata will be submitted to DataONE, a nationally recognized long-term archive for scientific data. Submissions will occur by initiating finalized datasets from the Workspace, having a final metadata review check by data management staff, and then a fully-automated submission process into the DataONE data federation¹. Workspace integration with DataONE will provides services for automatically transferring data and metadata, controlling access to data products as they are populated in the system, and services for replication and preservation of data. Workspace project metadata will be updated to include any identifiers associated with the data once it has been ingested into DataONE (e.g., DOI, archival accession numbers). This pathway will simplify preservation and publication for PIs while providing transparency to the data managers, program leads, and funders.

As a federally funded program, AOOS is required to submit data it generates to a national archive center. AOOS is working with the National Centers for Environmental Information (NCEI) to assist with the preservation of appropriate data types. However, not all of the AOOS data streams fall under the purview of the NCEI. To facilitate archival of the valuable assets not accepted by NCEI, AOOS also archives selected project data (primarily integrated ecological research projects) in the DataONE network. DataONE is one of the only available options for archiving the data that is regionally very valuable, including the EVOSTC GWA and HRM program data in the near term. A major advantage of DataONE is the fact that NCEI is a DataONE member node itself. As a member node, NCEI has access to all data archived in the DataONE network and, should it choose, can expose those data through its own catalog and search interfaces at any time.

OBJECTIVE 6. *Execute management, user feedback, and internal and external communications related to GWA and HRM data and data products.* During this proposed five-year term, the data management team will participate in program meetings, respond to user feedback, and maintain regular communication about project progress.

Milestone 1. Interface with program PIs on data management progress and procedures - Axiom gave an overview of the data management system and procedures to EVOS staff and HRM and GWA PIs at the initial kick-off meeting in Fall 2017. This presentation focused on a high-level description of the tools to be used and procedural changes from the initial five-year effort. These procedures were provided in writing and described more concretely at individual meetings with program leads PIs. Thereafter, Axiom will continue to attend

¹ <http://dataone.org>

scheduled PI meetings to present on data management progress and receive feedback on any recommended modifications. Presentations may include topics such as the percent of data submissions and metadata generation completed on time, new features or process updates in the data management system, and progress towards publishing data and data products. Axiom staff will also be available at PI meetings to give one-on-one training, hands-on assistance, or to answer questions about data management practices. Throughout the project, the project team will maintain regular contact with PIs about data management throughout the year. These communications will entail notification of approaching deadlines for data or metadata submission, questions related to these submissions, and/or response to PIs about data management procedures and responsibilities questions.

Milestone 2. Continually evaluate progress and new technologies to keep pace with program needs -

Implementing a system to serve the GWA and HRM data management needs is a core component of this proposed work. To ensure progress of the data management team in meeting these needs, regular and structured feedback is required from data management system users, i.e., the program leads and PIs. User feedback through surveys, group discussions, regular program lead teleconferences, and one-on-one meetings will be gathered throughout the course of this program. The feedback will be synthesized to identify what data management methods are working well and what procedural modifications or including new technologies could be made to improve the performance of the data management system. Improvements will be prioritized based on feasibility within program funding levels and implemented as is possible.

Milestone 3. Report progress annually to the EVOSTC - AOOS and Axiom will submit annual reports as detailed by the EVOSTC. These reports will document progress on objectives and milestones, as well as overall progress on data submission and metadata generation from GWA and HRM projects. Reporting will also include a final report at the conclusion of the five-year funding term.

B. Explanation for not completing any planned milestones and task

Finalized datasets will not be archived in the Research Workspace DataONE Member Node until Q3 FY 18, due to technical delays in updating the programmatic archive pathway.

All other milestones and tasks are on target (Objectives 2,3,4,5,6,7) or completed and to be revisited as necessary (Objectives 1 and 2).

C. Justification for new milestones and tasks

No new milestones or tasks.

3. COORDINATION AND COLLABORATION

A. Within an EVOTC-Funded Program

Provide a list and clearly describe the functional and operational relationships with other EVOSTC-funded program projects. This includes any coordination that has taken or will take place and what form the coordination will take (shared field sites or researchers, research platforms, sample collection, data management, equipment purchases, etc.).

B. With Other EVOSTC-funded Projects

Indicate how your proposed program relates to, complements or includes collaborative efforts with other proposed or existing programs and projects funded by the EVOSTC that are not part of a EVOSTC-funded program.

C. With Trustee or Management Agencies

Please discuss if there are any areas which may support EVOSTC trust or other agency work or which have received EVOSTC trust or other agency feedback or direction, including the contact name of the agency staff.

Please include specific information as to how the subject area may assist EVOSTC trust or other agency work. If the proposed program requires or includes collaboration with other agencies, organizations or scientists to accomplish the work, such arrangements should be fully explained and the names of agency or organization representatives involved in the program should be provided. If your proposal is in conflict with another project, note this and explain why.

A. Within an EVOSTC-Funded Program

Across EVOSTC Program coordination: Overall coordination of the data management effort for the EVOSTC-Funded Programs (GWA and HRM) is provided by Dr. Janzen, the AOOS Program Lead, Janzen is responsible for ensuring coordination within this project and across the GWA and HRM Programs. AOOS is dedicated to the EVOSTC programs is focused on data management project oversight to ensure integration across GWA and HRM Programs and the data management services. Coordination across the programs occurs through email, phone communications, and regularly scheduled in-person meetings. Dr. Janzen and representatives from the Axiom data management team attend the annual PI meetings each fall and January, and the regularly scheduled Program Management Team Lead phone calls to ensure a seamless response to data management and decision-support needs. Dr. Janzen also holds calls with the GWA and HRM Program Leads where any data managements questions or concerns can be elevated and resolved in a timely manner. These calls fall between annual PI meetings and semi-annual PI conference calls, or as needed.

EVOSTC GWA and HRM Program Data Management: The AOOS data management technical infrastructure is collaborative in the sense that the Workspace is designed to give open access across the GWA and HRM program teams for file sharing and transparency of data progress. Backing this infrastructure is a data management team that is well-coordinated with GWA and HRM program leads and science teams for timely data submissions and accuracy of metadata authoring, ensuring data and products are available to general science and resource management communities. Through this collaborative work structure, the data management team is positioned to respond to the needs of the GWA and HRM programs by providing both the required technical support and requested modifications to the Workspace to enhance it accessibility and utility to scientists.

Regular communication is maintained between the Axiom data management team and the GWA and HRM Program Leads and PIs. These communications are a continuation of effective working relationships developed with the science teams in the first five-year effort. At PI meetings AOOS and the data management team will continue to communicate to all PIs about data submission progress and procedures through presentations and group discussions. Using emails, PIs are notified of program data inventories and the submission timelines to help encourage compliance.

Individual project coordination: Regular communications also occur with individual project PIs through annual one-on-one meetings, and regular email and/or phone conversations. A one-on-one meeting will be held with each PI in November 2018 to track project progress and provide hands-on support for data organization, formatting, and metadata authoring. The data managers also use email to inform individuals PIs of their data submission progress using the data inventory tool, and to respond to PIs inquiries and/or requests for additional assistance. Depending on the location of individual PIs, this assistance is provided through the most practical communication method (e.g., email, phone correspondence, or scheduled meetings).

B. With Other EVOSTC-funded Projects

Further, the data management team is interacting with other EVOSTC-funded projects (e.g. PIGU Restoration and Lingering Oil) to provide them access to the Research Workspace to store data and final project reports. Working with the EVOSTC Science Coordinator, the data management team created a Research Workspace group for the EVOSTC members in spring 2018 for them to access final reports and other project documents loaded by the project PIs. The intent is to streamline access to up-to-date reports and alleviate sending large

documents by email. The data management team has provided the EVOSTC members and the other projects with technical assistance for creating an account and accessing information from the respective projects.

C. With Trustee or Management Agencies

AOOS brings a significant level of leveraged resources, infrastructure, regional data management projects and partnerships to the proposed effort. The project team provides data management visualization, and preservation services (including providing access to and facilitating the use of the Research Workspace) to a number of other programs that receive funding from or are administered or overseen by representatives from the Trustee Council agencies. Additionally, this work will benefit trustee or management agencies as all data and final data products produced by the GWA and HRM programs will be made available through the Gulf of Alaska data portal and DataONE Member Node, both of which are no-cost services that can be accessed by any member of the public. None of the programs or projects listed above conflict with this proposal. Some of these programs and their associated Trustee agencies are given below (Table B).

Table B. Other groups and agencies for which AOOS and Axiom coordinate data management services.

Group, Agency	Level and Type of Coordination	Representative
Arctic Marine Biological Observation Network (AMBON), Bureau of Ocean Management (BOEM)	Coordinate all data management activities for AMBON using the Workspace	Katrin Iken, Lead Principal Investigator
Core Program, North Pacific Research Board (NPRB)	Guidance given on data and metadata best practices; access to and facilitation of the Workspace; organization and archiving of historical projects	Matthew Baker, Science Director; Jo-Ann Mellish, Program Manager
Arctic Ecosystem Integrated Synthesis (Arctic EIS), BOEM	Provide guidance to program management on data and metadata best practices; access to and facilitation of the Workspace; organization and archiving of completed projects	Franz Mueter, Lead Principal Investigator
Central Beaufort Sea Wave and Hydrodynamic Modeling Study, BOEM	Develop and maintain the project website/data portal; establish internal project data sharing and secure storage; collate and ingest quality-reviewed historical project and new real-time instrument data to spatial database; prepare model outputs for discovery and visualization; submission of curated data to long-term archive	Jeremy Kasper, Lead Investigator
Marine Arctic Ecosystem Study (MARES), BOEM	Develop data management plans for each sampling effort; access to and facilitation of the Workspace; acquire and ingest into AOOS Arctic Data Portal environmental datasets identified by program PIs as important context for MARES program; facilitate conversion of data into long-term preservation-ready formats; submission of datasets to long-term archives	Francis Wiese, Lead Project Manager
Integrated Ocean Observing System (IOOS), National Ocean and Atmospheric Administration (NOAA)	Develop community standards for sensor observations; make regional data nationally accessible	Derrick Snowden, Data Management And Coordination (DMAC) System Architect
Beluga Sightings Database	Visualizations, guidance on building community	Mandy Migura, Marine

Visualization, NOAA-National Marine Fisheries Service (NMFS)	standards for submitting marine mammal stranding observations	Mammal Specialist
Alaska Ocean Observing System (AOOS) Data Management, NOAA	Data management; cyberinfrastructure; working directly with member and non-member organizations to ingest and document new datasets; visualizations	Molly McCammon, Director; Phil Mundy, Data Management Committee Chair
Central and Northern California Ocean Observing System (CeNCOOS) Data Management, NOAA	Data management; cyberinfrastructure; working directly with member and non-member organizations to ingest and document new datasets; visualizations	Francisco Chavez, Acting Director;
Southeast Coastal Ocean Observing System (SECOORA) Data Management, NOAA	Data management; cyberinfrastructure; working directly with member and non-member organizations to ingest and document new datasets; visualizations	Francisco Chavez, Acting Director;
Gulf of Alaska Integrated Ecological Research Program (GOAIERP), NPRB	Fully facilitated data and metadata management working directly with PIs, from initial sharing within the group to long-term archiving at NPRB	Danielle Dickson, Program Manager
Russian-American Long-term Census of the Arctic (RUSALCA), NOAA	Access to Workspace; guidance on data and metadata management; archiving; visualizations in support of mission	Kathy Crane, U.S. Mission Coordinator
Alaska Data Integration working group (ADIWg), U.S. Geological Survey (USGS)	Generate community standards for project data; advise on translation from ADIWg metadata content profile into suite of ISO geospatial metadata of standards	Josh Bradley, Data Manager

4. PROGRAM DESIGN

A. Overall Program Objectives

Identify the overall project objectives for the program as submitted in the original proposal.

B. Changes to Program Design

If the program 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 program.

A. Overall Program Objectives (as submitted in the original proposal)

Objective 1. Initiate data management services and oversight for EVOS GWA and HRM Program data-related activities.

Objective 2. Continue to standardize and provide access to data sets from the first five-year GWA and HRM efforts for continuity and integration.

Objective 3. Facilitate, monitor, and evaluate regular data submissions and metadata generation in the Research Workspace.

Objective 4. Provide, maintain, and modify technical infrastructure for user groups to access information produced or processed by the GWA and HRM Programs.

Objective 5. Publish and promote data collected by the GWA and HRM Programs, making it available for research, management, and general audiences.

Objective 6. Execute management, user feedback, and internal and external communications related to GWA and HRM data and data products.

Objective 7. Verify data and metadata completeness and final transfer at the term completion.

Proposed Objectives for FY19

- 1) **Objective 3.** Facilitate, monitor, and evaluate regular data submissions and metadata generation in the Ocean Workspace.
- 2) **Objective 4.** Provide, maintain, and modify technical infrastructure for user groups to access information produced or processed by the GWA and HRM Programs.
- 3) **Objective 5.** Publish and promote data collected by the GWA and HRM Programs, making it available for research, management, and general audiences.
- 4) **Objective 6.** Execute management, user feedback, and internal and external communications related to GWA and HRM data and data products.

Note: Objectives 1 and 2 were completed in FY17 and FY18 (as listed in the 2017-2021 data management program proposal form) but will be revisited as needed. Objective 7 will be completed in the last year of the program.

The Alaska Ocean Observing System (AOOS) is the recognized Alaska regional component of the national Integrated Ocean Observing System (IOOS) and serves as the regional Data Assembly Center for oceanographic and coastal data and information products in Alaska waters. This makes AOOS the logical entity to lead the data management component of the program since its mission is to address regional and national needs for ocean information, gather specific data on key coastal and ocean variables, and ensure timely and sustained dissemination and availability of these data to stakeholders that include scientists, natural resource managers, and the public. Axiom Data Science serves as the technical manager of the AOOS data management system, focused on developing scalable cyberinfrastructure that can be leveraged across a variety of users. Together, AOOS and Axiom will provide access to the existing AOOS cyberinfrastructure as well as a myriad of stakeholder networks for which information collected through the GWA and HRM Programs will be disseminated.

B. Changes to Program Design

No Changes

5. PROGRAM PERSONNEL – CHANGES AND UPDATES

If there are any staffing changes to Primary Investigators or other senior personnel please provide CVs for any new personnel and describe their role on the project.

No Changes or Updates

6. PROGRAM BUDGET

A. Budget Forms (Attached)

Provide completed budget forms.

B. Changes from Original Proposal

If your FY19 funding request differs from your original proposal, provide a detailed list of the changes and discuss the reason for each change.

C. Sources of Additional Funding

Identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

A. Budget Forms (Attached)

See Attached

B. Changes from the Original Proposal

No changes from the original proposal.

C. Sources of Additional Funding

AOOS will also make available one additional week of in-kind salary for Dr. Janzen (Operations Director, AOOS) bringing her commitment to the Data Management Program to 4 weeks in order to fulfill Program Lead duties under this award and to oversee program data integration activities into the AOOS data system. The value of Dr. Janzen’s in-kind support (includes salary, benefits, fiscal sponsor fees) will be \$2869.19 in FY19.

7. FY18 PUBLICATIONS AND PRODUCTS

Products include publications (include *in prep* and *in review*), published and updated datasets, presentations, and outreach during FY18.

Datasets generated by GWA and HRM programs from 2012 to 2017 that are stored in the Research Workspace and made publicly available in the Gulf of Alaska Data Portal and replicated and published in the DataONE repository with a digital object identifier(DOI) for long-term preservation. Final 2017 datasets will be made available to the Gulf of Alaska Data Portal at the end of FY18.

DOI	Program	Resource title	Principal Investigator
https://doi.org/10.24431/rw1k1u	Herring	Intensive Acoustic Surveys of Juvenile Herring, Prince William Sound, 2013-2014, EVOS Herring Program	Peter Rand
https://doi.org/10.24431/rw1k1v	Herring	Acoustic Juvenile Herring Abundance Data, Prince William Sound, 2012-2015, EVOS Herring Program	Peter Rand
https://doi.org/10.24431/rw1k111	Herring	Aerial surveys of juvenile herring, Prince William Sound, 2010-2016, EVOS Herring Program	Scott Pegau
https://doi.org/10.24431/rw1k115	Herring	Age at First Spawn for Herring in Prince William Sound, 2012-2015, EVOS Herring Program	Johanna Vollenweider, Ron Heintz
https://doi.org/10.24431/rw1k110	Herring	Fatty Acid Analysis as Evidence for Winter Migration of Age-0 Herring in Prince William Sound, 2010-2012, EVOS Herring Program	Ron Heintz, Fletcher Sewall
https://doi.org/10.24431/rw1k1z	Herring	Fish Predation on Juvenile Herring in Prince William Sound, Alaska, 2009-2012, EVOS Herring Program	Mary Anne Bishop
https://doi.org/10.24431/rw1k114	Herring	Genetic Stock Structure of Herring in Prince William Sound, 2012-2015, EVOS Herring Program	Sharon Wildes, Jeff Guyon
https://doi.org/10.24431/rw1k1y	Herring	Growth and Energy of Overwintering Herring in Prince William Sound, 2009-2012, EVOS Herring Program	Ron Heintz, Fletcher Sewall
https://doi.org/10.24431/rw1k1a	Herring	Validation of acoustic surveys for Pacific herring, 2010-2016: EVOS Herring Program	Mary Anne Bishop
https://doi.org/10.24431/rw1k11	Herring	Herring Infection Prevalence Data, 2007-2016, EVOS Herring Program	Paul Hershberger
https://doi.org/10.24431/rw1k17	Herring	High Temporal and Spatial Resolution Study of Herring Condition in Prince William Sound, Energetics Data, Prince William Sound, 2011-2012, EVOS Herring Program	Kristen Gorman, Tom Kline

https://doi.org/10.24431/rw1k16	Herring	High Temporal and Spatial Resolution Study of Herring Condition in Prince William Sound, Growth and Diet Data, 2011-2012: EVOS Herring Program	Ron Heintz, Fletcher Sewall, Kristen Gorman
https://doi.org/10.24431/rw1k13	Herring	Juvenile Herring Condition Monitoring, Energetics Data, Prince William Sound, 2005-2016, EVOS Herring Program	Kristen Gorman, Ron Heintz
https://doi.org/10.24431/rw1k15	Herring	Juvenile Herring Condition Monitoring in Prince William Sound, Growth and Diet Data, 2012-2016, EVOS Herring Program	Ron Heintz, Fletcher Sewall, Kristen Gorman
https://doi.org/10.24431/rw1k1i	Herring	Meta-analysis of Global Herring Population Dynamics, 1974 to 2011, EVOS Herring Program	John Trochta, Trevor Branch
https://doi.org/10.24431/rw1k1t	Herring	Using Bayesian Age-Structured-Analysis (ASA) Model for Herring Population Dynamics in Prince William Sound, EVOS Herring Program	Trevor Branch
https://doi.org/10.24431/rw1k116	Herring	Physical Oceanographic Characteristics of Herring Nursery Habitats in Prince William Sound, 2010-2012: EVOS Herring Program	Shelton Gay
https://doi.org/10.24431/rw1k14	Herring	Oceanographic Conditions in Prince William Sound, CTD, Chlorophyll-a, and Zooplankton Data: 2010-2012, EVOS Herring Program	Rob Campbell
https://doi.org/10.24431/rw1k1x	Herring	Tracking Seasonal Movements of Adult Pacific Herring in Prince William Sound, 2012-2014, EVOS Herring Program	Mary Anne Bishop
https://doi.org/10.24431/rw1k112	Gulf Watch	Continuous Plankton Recorder and Temperature Data, Gulf of Alaska, 2011-2016, Gulf Watch Alaska Environmental Drivers Component	Sonia Batten
https://doi.org/10.24431/rw1k18	Gulf Watch	GAK1 Mooring Timeseries data, Seward, AK, from the GAK1 project, 2012-2016, Gulf Watch Alaska Environmental Drivers Component	Seth Danielson, Thomas Weingartner
https://doi.org/10.24431/rw1k1b	Gulf Watch	CTD profile time series data from the GAK1 project, 2012-2016, Gulf Watch Alaska Environmental Drivers Component	Seth Danielson, Thomas Weingartner
https://doi.org/10.24431/rw1k19	Gulf Watch	Oceanographic Conditions in Prince William Sound, CTD, Chlorophyll-a, and Zooplankton Data: 2013-2016, Gulf Watch Alaska Environmental Drivers Component	Rob Campbell
https://doi.org/10.24431/rw1k1c	Gulf Watch	Oceanographic Monitoring in Cook Inlet and Kachemak Bay, Water Quality, Meteorological, and Nutrient Data collected by the National Estuarine Research Reserve System's System-wide Monitoring Program (NERRS SWMP), 2012-2016, Gulf Watch Alaska Environmental Drivers Component	Kris Holderied, Angela Doroff
https://doi.org/10.24431/rw1k1d	Gulf Watch	Oceanographic Monitoring in Cook Inlet and Kachemak Bay, CTD Data, 2012-2016, Gulf Watch Alaska Environmental Drivers Component	Kris Holderied, Angela Doroff
https://doi.org/10.24431/rw1k12	Gulf Watch	Oceanographic Monitoring in Cook Inlet and Kachemak Bay, Zooplankton Data, 2012-2015, Gulf Watch Alaska Environmental Drivers Component	Kris Holderied, Angela Doroff
https://doi.org/10.24431/rw1k1l	Gulf Watch	Seward Line Conductivity, Temperature, and Depth (CTD) Data, 2012 to 2016, Gulf Watch Alaska Environmental Drivers Component	Russell Hopcroft, Thomas Weingartner, Seth Danielson
https://doi.org/10.24431/rw1k1j	Gulf Watch	Prince William Sound Chlorophyll-A and Nutrient Data, 2012 to 2016, Gulf Watch Alaska Environmental Drivers Component	Russell Hopcroft
https://doi.org/10.24431/rw1k1m	Gulf Watch	Seward Line and Lower Cook Inlet Marine Bird Survey Data, 2006-2016, Gulf Watch Alaska Nearshore Component	Kathy Kuletz
https://doi.org/10.24431/rw1k1k	Gulf Watch	Prince William Sound Zooplankton Data, 1997 to 2016, Gulf Watch Alaska Environmental Drivers Component	Russell Hopcroft

http://dx.doi.org/10.5066/F7KD1W1M	Gulf Watch, USGS	Harlequin duck capture and EROD activity data from Prince William Sound, Alaska, 2011, 2013, and 2014, Gulf Watch Alaska Lingering Oil Component	Dan Esler, Brenda Ballachy
http://dx.doi.org/10.5066/F789141P	Gulf Watch, USGS	Sea otter gene expression data from Kodiak, the Alaska Peninsula and Prince William Sound, Alaska, 2005-2012	Dan Esler, Brenda Ballachy
https://doi.org/10.24431/rw1k1h	Gulf Watch	Lingering Oil Measurements, Site, Sample, and Photographic Data from Prince William Sound, 2015, Gulf Watch Alaska Lingering Oil Component	Mandy Lindeberg, Mark Carls
https://doi.org/10.24431/rw1k1o	Gulf Watch	Long-term Monitoring of Ecological Communities in Kachemak Bay, 2012-2016, Gulf Watch Alaska Nearshore Component	Katrin Iken, Brenda Konar
https://doi.org/10.24431/rw1k1e	Gulf Watch	Sea Otter Diet Data, Long-term Monitoring of Ecological Communities in Kachemak Bay, 2008-2015: Gulf Watch Alaska, Nearshore Component	Angela Doroff
http://dx.doi.org/10.5066/F7WH2N5Q	Gulf Watch, USGS	Gulf Watch Alaska Nearshore Component: Black oystercatcher nest density and chick diets from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park, 2006-2016 Data	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
https://doi.org/10.5066/F78S4N3R	Gulf Watch, USGS	Gulf Watch Alaska Nearshore Component: Monitoring Site Locations from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
https://doi.org/10.5066/F7FN1498	Gulf Watch, USGS	Gulf Watch Alaska Nearshore Component: Intertidal Mussel Site Data from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park, 2008-2015	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
https://doi.org/10.5066/F7WS8RD4	Gulf Watch, USGS	Gulf Watch Alaska Nearshore Component: Intertidal Mussel Site Data from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park, 2016	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
http://dx.doi.org/10.5066/F7513WCB	Gulf Watch, USGS	Gulf Watch Alaska Benthic Component: Intertidal Rocky Shore Limpet Size Data from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park, 2006-2014	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
http://dx.doi.org/10.5066/F7513WCB	Gulf Watch, USGS	Gulf Watch Alaska Benthic Component: Intertidal Rocky Shore Nucella and Katharina counts from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park, 2006-2014	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
http://dx.doi.org/10.5066/F7513WCB	Gulf Watch, USGS	Gulf Watch Alaska Benthic Component: Intertidal Rocky Shore Invertebrate and Algae from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park, 2006-2014	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
http://dx.doi.org/10.5066/F7513WCB	Gulf Watch, USGS	Gulf Watch Alaska Benthic Component: Intertidal Rocky Shore Seastar counts from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park, 2006-2014	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger

			Kloeker, George Esslinger
https://dx.doi.org/10.5066/F7416V6H	Gulf Watch, USGS	Gulf Watch Alaska Benthic Component: Marine Bird and Mammal Survey Data from Katmai National Park and Preserve and Kenai Fjords National Park, 2006-2015	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
http://dx.doi.org/10.5066/F7WH2N3T	Gulf Watch, USGS	Gulf Watch Alaska Benthic Component: Marine Water Quality, Water Temperature from Prince William Sound, Katmai National Park & Preserve, and Kenai Fjords National Park, 2006-2014	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
http://dx.doi.org/10.5066/F7WH2N3T	Gulf Watch, USGS	Gulf Watch Alaska, Benthic Monitoring Component: Sea otter Carcass Collection from Prince William Sound, Katmai National Park & Preserve, and Kenai Fjords National Park	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
http://dx.doi.org/10.5066/F7H993CZ	Gulf Watch, USGS	Gulf Watch Alaska, Benthic Monitoring Component: Sea otter foraging observations from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park, 2013	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
http://dx.doi.org/10.5066/F7CJ8BN7	Gulf Watch, USGS	Sea Otter Aerial Surveys in Katmai National Park and Preserve 2008 and Kenai Fjords National Park 2007	Heather Coletti, Jim Bodkin, Brenda Ballachy, Dan Monson, Dan Esler, Mandy Lindeberg, Tom Dean, Ben Weitzman, Kim Kloeker, George Esslinger
https://doi.org/10.24431/rw1k1w	Gulf Watch	Fall and Winter Seabird Abundance Data, Prince William Sound, 2007-2016, Gulf Watch Alaska Pelagic Component	Mary Anne Bishop
http://dx.doi.org/10.5066/F74J0C9Z	Gulf Watch, USGS	Gulf Watch Alaska Forage Fish Component: Fish morph data in Prince William Sound, Alaska 2012-2015	John Piatt, Mayumi Arimitsu
http://dx.doi.org/10.5066/F74J0C9Z	Gulf Watch, USGS	Gulf Watch Alaska Forage Fish Component: Marine bird and mammal surveys in Prince William Sound, Alaska 2012-2013 and 2015	John Piatt, Mayumi Arimitsu
http://dx.doi.org/10.5066/F74J0C9Z	Gulf Watch, USGS	Gulf Watch Alaska Forage Fish Component: Oceanographic profile data from various regions in Prince William Sound, 2012-2015	John Piatt, Mayumi Arimitsu
http://dx.doi.org/10.5066/F74J0C9Z	Gulf Watch, USGS	Gulf Watch Alaska Forage Fish Component: Zooplankton biomass data from 2012-2015 in Prince William Sound, Alaska	John Piatt, Mayumi Arimitsu
http://dx.doi.org/10.5066/F74J0C9Z	Gulf Watch, USGS	Gulf Watch Alaska Forage Fish Component: Nutrients data from CTD sampling stations in Prince William Sound, Alaska 2012-2015	John Piatt, Mayumi Arimitsu
http://dx.doi.org/10.5066/F74J0C9Z	Gulf Watch, USGS	Gulf Watch Alaska Forage Fish Component: Fish catch data in Prince William Sound, Alaska 2012-2015	John Piatt, Mayumi Arimitsu
http://dx.doi.org/10.5066/F74J0C9Z	Gulf Watch, USGS	Gulf Watch Alaska Forage Fish Component: Hydroacoustic surveys in Prince William Sound, Alaska 2014-2015	John Piatt, Mayumi Arimitsu
https://doi.org/10.24431/rw1k1q	Gulf Watch	Lipid Analyses for Pacific Herring, Invertebrates and Humpback Whales in the Gulf of Alaska, 2012-2015, Gulf	John Moran, Jan Straley

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https://doi.org/10.24431/rw1k1n	Gulf Watch	Significance of Whale Predation On Natural Mortality Rate of Pacific Herring in Prince William Sound, Alaska: 2006 - 2009, 2011-2015, Gulf Watch Alaska Pelagic Component	John Moran, Jan Straley
https://doi.org/10.24431/rw1k1p	Gulf Watch	Dall's and Harbor Porpoise Survey Data, Prince William Sound, Alaska: 2007 - 2008, 2011-2015, Gulf Watch Alaska Pelagic Component	John Moran, Jan Straley
https://doi.org/10.24431/rw1k1f	Gulf Watch	Acoustic Recordings of Killer Whales in Prince William Sound and Kenai Fjords, 2012 to 2016, Gulf Watch Alaska Pelagic Component	Craig Matkin
https://doi.org/10.24431/rw1k1s	Gulf Watch	Kenai Fjords and Prince William Sound Long-Term Photographic Monitoring of Killer Whales, 2012-2016, Gulf Watch Alaska Pelagic Component	Craig Matkin
https://doi.org/10.24431/rw1k1g	Gulf Watch	Prince William Sound Killer Whale Satellite Telemetry Data, 2004 to 2016, Gulf Watch Alaska Pelagic Component	Craig Matkin
https://doi.org/10.24431/rw1k1r	Gulf Watch	Behavior and Feeding Summaries for Killer Whales in Alaska, 2012-2016	Craig Matkin
https://doi.org/10.24431/rw1k1w	Gulf Watch	Prince William Sound Marine Bird Surveys, July 2012 to 2016, Gulf Watch Alaska Pelagic Component	Robert Kaler, Kathy Kuletz