ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 10.3.14

1. Program Number: *See*, Reporting Policy at III (C) (1).

12120114-H

2. Project Title: *See*, Reporting Policy at III (C) (2).

Science Coordination and Synthesis

3. Principal Investigator(s) Names: *See*, Reporting Policy at III (C) (3).

Kris Holderied and Tammy Hoem Neher

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

February 1, 2014-January 31, 2015

5. Date of Report: *See*, Reporting Policy at III (C) (5).

March 1, 2015

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

www.gulfwatchalaska.org

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

Through much of this year, we focused significant efforts on developing the Gulf Watch Alaska (GWA) program Year 3 science synthesis report (Hoem Neher et al. *in review*) and planning for the joint program science workshop that was held Feb 4-6, 2015. Synthesis report preparation included developing the structure of the report with the science coordinating committee (SCC) and principal investigators (PIs), writing the executive summary, introduction and recommendation chapters, and coordinating, compiling and editing the monitoring component summaries and articles. The annual PI meeting in November 2014 was focused on finalizing the synthesis report and we held multiple work sessions with the program management team and SCC before and after the meeting. We coordinated with EVOSTC staff and the Herring Research and Monitoring (HRM) program lead to plan the joint science workshop with the EVOSTC science panel and developed presentations for both the EVOSTC public advisory council and science panel.

We continued to develop integration and visualization tools both for within and outside the program, and improved access to program information and data through the GWA website and Gulf of Alaska data portal hosted by the Alaska Ocean Observing System (AOOS). We continued to expand coordination with other organizations, including sharing information with the North Pacific Research Board (NPRB) Gulf of Alaska Integrated Ecosystem Research Program and the HRM program. Below is a summary of science coordination and synthesis work performed during the reporting period by project objective, Table 1 highlights the project milestones and deliverables met during this reporting period.

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

Two teleconferences were held with PIs and the SCC for Gulf Watch Alaska in May and July 2014. Most investigators attended the teleconference meetings and those that did not received meeting notes and held short discussions with the science coordinator and management team members. The annual program meeting was attended by all PIs (or representatives) in November and a second in-person meeting was held in conjunction with the Alaska Marine Science Symposium in January 2015, with all PIs present in person or by phone. Meeting agendas, summaries and other materials are posted on the internal AOOS GWA program workspace. The SCC and program management team met formally via teleconference in May, July, October, and December 2014, with extensive additional coordination by phone and in person, to plan and discuss layout, content, and authorship of the synthesis document, provide input on needed data management services, and address on-going program coordination issues.

The marine birds working group (led by Kuletz and Esler and composed of investigators from the two seabird monitoring projects, harlequin ducks, conceptual modeling, and nearshore monitoring projects) met by conference call in March 2014 to discuss progress on the group's action items for the synthesis report and finalize products. Final products for the synthesis report included a discussion of the value of marine bird monitoring to understand ecological changes along with several research summaries authored by working group members.

The environmental drivers working group (composed of all component PIs) coordinated before and during the November 2014 PI meeting to develop the component chapter, with a focus on regional variability in marine conditions and linkages between estuary (Prince William Sound and Cook Inlet) and shelf waters. The chapter introduction addressed coordination between different sampling protocols in long-term time series, spatial and temporal variability in oceanographic data, and ecological implications of observed trends. Research summaries were contributed for all component projects.

We continue to make changes to the Ocean Workspace, GWA website, and data portal to facilitate communication between PIs and data access. We worked with our partners at Axiom to develop new functions on the Workspace and portal, which included the ability to define attributes within the Workspace metadata tool and to convert oceanographic data to the more easily archived netCDF format. Project-level metadata is available on the portal with all project descriptions and file-level metadata is provided with all data files published to the portal.

Finally, in partnership with the NOAA Kasitsna Bay Laboratory, we developed an interactive intranet Google Site for the program management team and PIs to share program updates, field highlights, and research discussions. To improve program coordination, the site is also linked to Google Drive folders and the GWA Google calendar.

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

We have seen substantial progress in integration between the GWA-HRM programs this year that was recognized by EVOSTC science panel members at the February 2015 joint science workshop (referring to Pete Peterson's comment that the two programs are slowly becoming one). PIs are closely

coordinating across the programs on field activities, process studies, modeling, and working groups. Examples include integrated work between the HRM program with three of the environmental drivers component projects and humpback whales, marine birds, and forage fish projects that was presented during the January 2015 AMSS and February 2015 EVOSTC joint science workshop and described in the synthesis reports from both programs.

The conceptual modeling project developed a series of sub-models to assist with understanding of ecology by focusing on various drivers of ecosystem function. These models are being used to facilitate discussion within the program teams and for outreach. One sub-model completed this year was a conceptual figure for the nearshore component provided for the synthesis report and several presentations. Three additional sub-models are in progress and are centered on: 1) top-down processes, such as whale predation; 2) bottom-up processes such as the effects of temperature and nutrients on plankton production; and 3) "lynch-pin" processes, such as the key role of forage fish in the ecological processes in the Gulf of Alaska.

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

We continued developing and enhancing a variety of tools to communicate monitoring program information between PIs and to a broader audience of resource managers, other researchers, and the general public. In September of this year, we held an open webinar on the GWA program, aimed at informing resource managers around the state about the program. The workshop introduced the program and projects, showed data access tools, and asked for input on tools that would be useful for management needs. In addition, we routinely update and add information to the public access website and data access portal, with the primary update completed in spring. Finally, we are planning on partnering with Axiom to apply data visualization tools they have been developing (with our input on usability) to data from several GWA projects this year.

Deliverable/Milestone	Status
Coordinate development of year 3 science synthesis report. Assist in initial planning of joint science workshop between GWA and HRM programs.	Synthesis report was completed and submitted Dec 1 2014. The report will be finalized after EVOSTC comments are received and incorporated. Coordinated GWA program attendees and presentations for the joint science workshop held Feb 4-6th.
Develop an example interactive data visualization tool in coordination with data management and conceptual ecological modeling teams.	Assisted AOOS/Axiom with development and testing of online data visualization tools on the AOOS data portal. Reviewed data files from all projects are loaded and available for access.
Submit year 4 work plan.	Year 4 work plans were prepared or edited as needed and were provided Sept. 2 to Trustee Council staff. Workplans were approved during the November EVOSTC meeting.
Facilitate annual PI meeting	The program management team and SCC planned the meeting agenda, conducted the meeting, and coordinated associated work group discussion sessions.
Conduct annual PI meeting	Meeting was held in November 2014 and focused on final synthesis report preparation and planning for the February 2015 joint science workshop.
Attend Alaska Marine Science Symposium and provide update to GWA program	Kris Holderied presented an update on monitoring program highlights from the GWA program at AMSS in January 2015.
Submit report on synthesis of all available historical data from LTM projects	The NCEAS project is submitting a progress report on the historical data collection in conjunction with this annual report.
Submit annual project report	This document constitutes report submission.

8. Coordination/Collaboration: *See,* Reporting Policy at III (C) (8).

As described above in the summary of work performed, many of the objectives and tasks performed under this project are efforts to build and facilitate coordination both within the GWA program and between the GWA and HRM programs as well as outreach information to other entities. To summarize:

- Planned program meetings, teleconferences, and workshops
- Attended HRM annual meeting, work closely with HRM science coordinator
- Worked closed with the data management team to provide program information and data on the website, Workspace, and public data portal
- Worked with GWA outreach committee to develop new outreach products and showcase
- Coordinated preparation of GWA program synthesis report, annual reports, and work plans
- Presented program materials at numerous meetings, workshops, and conferences

9. Information and Data Transfer: *See,* Reporting Policy at III (C) (9).

We are in the process of assisting the outreach team in updates to the program website. Program PIs and their staff have participated in two public outreach events: public Discovery Labs at the Kachemak Bay Research Reserve in Homer, Alaska in August 2014 and the International Shorebird Festival in Cordova, Alaska in May 2014. Additionally, we worked with the outreach team (Eric Cline at TerraGraphica), to design and print outreach packets for distribution at public events. The packets contain single-page project descriptions of all the GWA projects, bookmarks, program fliers, and program folders. The science synthesis team worked with the program PIs to provide content and editorial review. We continue work to improve and update the program website, outreach materials, and data portal.

Publications: We submitted the program science synthesis report in December 2024 to EVOSTC. The report is currently in review and will be finalized after comments from EVOSTC are received, reviewed with the PIs and science review team, and incorporated.

Hoem Neher, T., B. Ballachey, K. Hoffman, K. Holderied, R. Hopcroft, M. Lindeberg, M. McCammon, and T.Weingartner, editors. *In review*. Quantifying temporal and spatial variability across the Northern Gulf of Alaska to understand mechanisms of change. Gulf Watch Alaska program science synthesis report. Submitted to the Exxon Valdez Oil Spill Trustee Council, December 1, 2014.

Conference and workshop presentations and attendance: Multiple public presentations were made in a variety of venues on the integrated Gulf Watch Alaska program during this year. Kris Holderied gave Gulf Watch Alaska program overview talks at the April 2014 Community-based Monitoring workshop in Anchorage, September 2014 NOAA ecological forecasting webinar in Anchorage, October 2014 EVOSTC PAC meeting, November 2014 EVOSTC meeting, and January 2015 Alaska Marine Science Symposium. Tammy Hoem Neher gave Gulf Watch Alaska program overview presentations at the Herring Research and Monitoring program meeting in March 2014, and the Igniting Knowledge of Coastal and Marine Research in Kachemak Bay symposium in April 2014. The program hosted an information webinar for resource managers in September, 2014 that presented an overview of the program and how to access GWA data. The science synthesis team also supported outreach for the GWA program during a Kachemak Bay Research Reserve Discovery Lab on the program, with over 300 people attending on three separate days. Topics included monitoring program results, history of the EVOS and information on resources and ecosystems injured by the spill.

Data and or Information products: Efforts to develop information products this year were focused on planning, writing, discussing, reviewing, and editing the GWA program synthesis report submitted to the EVOSTC in December 2014. In addition, we have improved several aspects of the program metadata tool, allowing attribute information to be automatically assigned and automated loading of materials from the workspace to the data portal. We also worked with the data management team to improve how oceanographic datasets can be efficiently converted to netCDF format as well as traditional flat files.

Project data uploaded to program data portal: Not applicable to this project.

10. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (C) (10).

None for this project

11. Budget: *See,* Reporting Policy at III (C) (11).

Project spending from prior years is slightly delayed, with less than a 10% difference from cumulative proposed amounts for years 1-3. Computer purchases were not completed with project funding due to a change in our agency IT acquisition policies (a computer has been provided in-kind by NOAA for the science coordinator). Requirements for data visualization software are being re-evaluated, based on discussions with the data management team on emerging technology. Travel obligations were delayed by federal travel restrictions in prior years. We expect to complete obligation of prior year contract and commodity funds by the end of federal FY15.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 10.3.14

1. Program Number: *See*, Reporting Policy at III (C) (1).

12120114-128102

2. Project Title: *See*, Reporting Policy at III (C) (2).

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

3. Principal Investigator(s) Names: *See*, Reporting Policy at III (C) (3).

Tuula E Hollmen (Principal Investigator)

Suresh A Sethi (Collaborator)

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

February 1, 2014-January 31, 2015

5. Date of Report: *See*, Reporting Policy at III (C) (5).

March 1, 2015

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

www.gulfwatchalaska.org

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

A general conceptual synthesis model for Gulf Watch Alaska program was developed during the first phase of the modeling project. In the current reporting period, work has focused on four areas:

1. Publishing results from the first two years of method development and modeling.
2. Development of a framework and working groups for a suite of submodels to explore and represent key hypotheses relating to the components of our program: environmental drivers, nearshore, pelagic, and lingering oil.
3. Development of visual aids to represent ecosystem structure and monitoring efforts related to the program components.
4. Development of a framework to consider monitoring priorities and management relevance to assist long term programmatic planning efforts.

Our first manuscript based on conceptual modeling development for Gulf Watch Alaska program was submitted in 2014 and is currently in revision to address reviewer comments. Development and refinement of a semi-quantitative expert knowledge rating tool was presented at the Alaska Marine Science Symposium in January 2015. Details about these publications and presentations are given in section 9.

Our conceptual modeling continues with development of a series of sub-models to explore hypotheses among the key program components: nearshore (Sub-model 1), pelagic (Sub-models 2, 3), and environmental drivers (Sub-model 4).

Sub-model 1: Key Trophic Linkages in Nearshore Northern Gulf Ecosystems

The benthic nearshore model will examine the impact of changes in invertebrate prey fields on consumers of interest as measured by a suite of behavioral and demographic performance metrics. The overall goals of the modeling effort are to organize understanding about trophic linkages in the nearshore system, and the strength of relationships between invertebrates and consumers of interest, provide semi-quantitative simulation models to forecast consumer population outcomes/effects on consumer performance metrics

resulting from changes in invertebrate prey fields, identify data gaps, and prioritize research to fill data gaps. A unique aspect of this modeling approach is that considerable empirical, quantitative information exists on diet compositions for the consumers of interest and energetic requirements may also be available for consumer taxa. We have developed the predator response metrics and prey data input framework. Prey data compilation is in progress.

Sub-model 2: Ecological Linchpin with Forage Fish Abundance

This conceptual sub-model focuses on the dynamics of a suite of forage fishes found in the Northern GOA. The sub-model examines linkages among forage fish prey, a suite of selected forage fish species, and higher trophic species populations. Salmon and other pelagic, marine forage fishes such as capelin, sand lance, and herring play important roles in the marine food web as predators, competitors, and prey. These connections, when examined through functional groups or shared similarities (i.e. examining loss of shared prey items across multiple species) can provide unique insights into food web dependencies and future management considerations. The working group of experts is identified and planning for a modeling workshop is in progress.

Sub-model 3: Top-down Control with Humpback Whale Predation

Much speculation regarding controlling factors for schooling and highly fecund fishes, such as Pacific herring, has focused on bottom up factors including availability of prey and suitable habitat. An alternative hypothesis with supporting evidence suggests that increasing predator populations may be acting as a top down controlling agent for these fish. This conceptual sub-model explores the relationships between humpback whale prey types and seasonal patterns that can lead to a better understanding of the influence that predation may have on suppressed, economically important fisheries. Current understanding about the processes affecting herring-whale dynamics in the Northern GOA was explored in a sub-model exercise rating properties of linkages in a zooplankton-herring-whale sub-model system. The pelagic team has explored movements and distribution of humpback whales in Prince William Sound, represented in a conceptual model.

Sub-model 4: Bottom-up Control with Environmental Forcing on Plankton Populations

This conceptual sub-model focuses on plankton production and the various environmental conditions that are thought to act as drivers of primary and secondary production in the northern GOA. Levels of primary production are related to nutrient availability and solar input. Factors that influence these aspects include levels of stratification and mixing related to freshwater input, wind mixing, topography, and upwelling of nutrients. The sub-model will explore ecosystem responses to changing climate and, because plankton production is a primary source of energy conversion for higher trophic levels, the sub-model will have key ties to other models addressing higher trophic levels and associated management needs for coastal communities. A working hypothesis relating to effect so potential pathways of effect of water stratification on phytoplankton bloom has been visualized in a conceptual model template.

Development of visualization tools continued. We have developed a graphic template for visual representation of Gulf of Alaska ecosystem in program Adobe Illustrator. The template may be modified to provide visualization tools for Gulf Watch program components (environmental drivers, nearshore, pelagic, lingering oil). We used the template to develop a visual representation of the nearshore ecosystem component and the environmental drivers component. We also developed a visual representation of the submodeling plan within the framework of the general ecosystem model developed based on input from Gulf Watch Alaska principal investigators.

Structured decision support tools are used to develop an adaptive framework to guide monitoring efforts in long term, and link monitoring efforts with management objectives. We develop decision models to identify a suite of potential scenarios and impact pathways, and construct an adaptive framework to guide scientific study and monitoring efforts to support management of resources based on indicators of change. The framework will offer adaptive guidance to monitoring data collection, based on learning contribution by the monitoring conducted by the Gulf Watch Alaska program. Our conceptual modeling efforts will contribute to the development of the adaptive framework by characterizing current understanding of linkages between drivers and responses, and predicted effects and indicators of change. Input from scientific experts and resource managers will be incorporated into the framework. We will develop the structure and template for

the adaptive framework using conceptual and decision modeling tools during 2015-2016, and the process will form a planning tool and framework for the program over the next two decades.

Deliverable/Milestone	Status
Continue development of conceptual models (component submodels, management applications, stakeholder objectives)	In progress. Framework for nearshore model developed, data input in progress. Concepts for models on management applications in development. Framework for considering long term monitoring priorities in development.
Continue development of interactive data visualization tools	In progress. Conceptual model based visualization tools for nearshore and environmental drivers components developed.
Attend annual PI meetings and Alaska Marine Science Symposium	Completed, November 2014 and January 2015. Presented a project update at Alaska Marine Science Symposium.

8. Coordination/Collaboration: *See,* Reporting Policy at III (C) (8).

A. The current goals of the conceptual modeling effort focus on development of submodels representing components and integrated hypotheses about ecosystem dynamics in our study area in the Gulf of Alaska. The process of developing component submodels involves close internal coordination and collaboration within and among Gulf Watch program components. Forage fish submodel will also involve coordination and collaboration between eth two programs.
B. Current coordination is focusing on collaboration within Gulf Watch Alaska program and between Gulf Watch Alaska and Herring Research Program.
C. Current coordination is focusing on collaboration within Gulf Watch Alaska program and between Gulf Watch Alaska and Herring Research Program.

9. Information and Data Transfer: *See,* Reporting Policy at III (C) (9).

- Conference presentation: Hollmen, TE and Sethi SA. Conceptual models are flexible tools for research planning, prioritization, and communication. Alaska Marine Science Symposium, Anchorage, Alaska January 2015.
- Manuscript in revision: Conceptual ecological models to synthesize, organize, and prioritize research in socioecological systems.
- Data and/or information products developed during the reporting period: Visualization of submodel structure, nearshore ecosystem submodel, and environmental drivers submodel.

10. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (C) (10).

N/A

11. Budget: *See,* Reporting Policy at III (C) (11).

There is a difference of >10% from the amount proposed and the amount spent to date for several categories of this project. This is due to differences in personnel costs expended as contracts, and there is lag in the sum total due to university invoicing cycles. Also, we are recruiting a postdoc to work with us, so all carryover is anticipated to be expended in personnel over the next two years.

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	Actual Cumulative
Personnel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Travel	$4.2	$4.2	$4.2	$6.6	$4.2	$23.3	$8.7
Contractual	$2.5	$2.5	$2.5	$2.5	$2.5	$12.5	$0.0
Commodities	$13.0	$7.0	$7.0	$9.0	$6.0	$42.0	$1.3
Equipment	$5.0	$7.7	$0.0	$0.0	$0.0	$12.7	$0.0
SUBTOTAL	$24.7	$21.4	$13.7	$18.1	$12.7	$90.5	$10.0
General Administration (9% of subtotal)	$2.2	$1.9	$1.2	$1.6	$1.1	$8.1	$0.9
PROJECT TOTAL	$26.9	$23.3	$14.9	$19.7	$13.8	$98.6	$10.9
Other Resources (In kind Funds)	$55.0	$55.0	$55.0	$130.0	$30.0	$325.0	$110.0

COMMENTS:
NOAA Kasitsna Bay Laboratory. In kind contribution: CTD equipment ($5K for year 3, $25K total for FY12-16); NOAA KBL laboratory staff salary ($25K for year 3, $125K total for FY12-16).
Additional leveraged funding: $25K funding received from AOOS ($100K total for FY12-FY15) for Kachemak Bay oceanography and ocean acidification monitoring. $75K funding received from BOEM in FY15 for Cook Inlet oceanographic monitoring.

FY12-16

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

FORM 4A
TRUSTEE AGENCY SUMMARY