

## Conceptual Ecological Modeling – Hollmen (ASLC, 15120114-I)

<b>FY15 PROJECT PROPOSAL SUMMARY PAGE</b> <b>Continuing, Multi-Year Projects</b>					
<b>Project Title:</b> Long-term Monitoring: Synthesis and Conceptual Modeling - Conceptual Ecological Modeling					
<b>Project Period:</b> February 1, 2015 – January 31, 2016					
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<b>Study Location:</b> N/A					
<b>Project Website:</b> www.gulfwatchalaska.org					
<p><b>Abstract*:</b> This project is a component of the integrated Gulf Watch Alaska Long-term Monitoring of Marine Conditions and Injured Resources and Services program. Under this research project, we will develop conceptual ecological models to support the synthesis and planning relating to the long term monitoring program in Prince William Sound, outer Kenai coast, and lower Cook Inlet/Kachemak Bay. To develop these models, we will summarize system components, processes, and influences into a synthetic framework. The conceptual models will assist in identification of data needs and development of long term monitoring priorities and, by iterative revision and refinement of models, demonstrate progress in understanding of ecosystem structure and function through the Gulf Watch Alaska program. The conceptual models will also provide guidance for development of numerical and quantitative models of system function and responses to external influences. Finally, the conceptual models will provide a communication tool among scientists, resource managers, policy-makers, and the general public, and will provide visualization and interactive tools to support outreach efforts of the Gulf Watch Alaska program.</p> <p>We have developed a general conceptual ecosystem model based on input from principal investigators of the Gulf Watch Alaska program, representing current understanding of system structure and function by the program PIs. We have developed a semi quantitative linkage rating tool to characterize desired properties of interactions and relationships among system components. The rating tool has been applied to an example sub model, and will be used in explore and rank properties of a suite of musicale and management oriented sub models currently in development. Additionally, our team is developing decision support tools to assist the program with prioritization of monitoring variables and linkages to key management objectives.</p>					
<b>Estimated Budget:</b>					
<b>EVOSTC Funding Requested*</b> (must include 9% GA):					
<b>FY12</b>	<b>FY13</b>	<b>FY14</b>	<b>FY15</b>	<b>FY16</b>	<b>TOTAL</b>
\$83.1	\$91.9	\$95.6	\$78.6	\$81.9	\$431.0
<b>Non-EVOSTC Funds to be used:</b>					
<b>FY12</b>	<b>FY13</b>	<b>FY14</b>	<b>FY15</b>	<b>FY16</b>	<b>TOTAL</b>
<i>*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.</i>					
<b>Date:</b> September 2, 2014					

## **I. EXECUTIVE SUMMARY**

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

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

### **The objectives of the conceptual modeling project are:**

1. *Develop conceptual ecological models, summarizing key components, processes, and functions of the study system*
2. *Develop computer applications and web-based interfaces for interactive data exploration and visualization*

We have developed a general conceptual ecosystem model based on input from principal investigators of the Gulf Watch Alaska program, representing current understanding of system structure and function by the program PIs. We also have developed a rating system to elicit from experts and include quantitative information on properties of system linkages into conceptual ecological models. We plan to iteratively update the general model to demonstrate progress of research and learning about the structure and function of the Gulf of Alaska ecosystem by the Gulf Watch monitoring program. We also plan to apply the linkage rating methods to develop a suite of sub models to explore ecosystem components and control mechanisms in the Gulf in greater detail. Finally, we plan to elicit and link management objectives to our monitoring objectives by using a combination of modeling and decision support tools. The process will support the identification and ranking of priority long term monitoring variables for the program.

Publication update:

Manuscript: *Conceptual models are flexible tools for research planning, prioritization, and communication* submitted in August 2014.

## **II. COORDINATION AND COLLABORATION**

### **A. Within a EVOTC-Funded Program**

The components and projects funded under the Gulf Watch program are closely linked to the conceptual modeling project. The conceptual modeling is driven by expert input from program PIs. The input is gathered in modeling workshops, working group meetings, conference calls, and by email surveys.

### **B. With Other EVOSTC-funded Projects**

### **C. With Trustee or Management Agencies**

### III. PROJECT DESIGN – PLAN FOR FY15

#### A. Objectives for FY15

*Continue development of conceptual models*

*Continue development of interactive/data visualization tools*

*Attend annual PI meetings and Alaska Marine Science Symposium*

*Prepare modeling progress update for annual report*

#### B. Changes to Project Design

No changes occurred.

### IV. SCHEDULE

#### A. Project Milestones for FY 15

No substantive changes are proposed.

**Objective 1.** Continue development of conceptual models

*To be met by January 2016*

Task 1: *Draft first set of component sub models – to be met February 2015*

Task 2: *Elicit stakeholder input on management objectives – to be met May*

2015

Task 3: *Design conceptual models focusing on management applications and addressing management problems identified by stakeholders – to be met October 2015*

Task 4: *Annual review and update of general, dynamic conceptual ecosystem models – to be met November 2015*

**Objective 2.** Continue development of interactive/data visualization tools

*To be met by January 2016*

Task 1: *Data visualization tools based on sub models – to be completed July*

2015

**Objectives 3.** Attend annual PI meetings and Alaska Marine Science Symposium

*To be met by November 2015 and January 2016*

**Objective 4:** Prepare modeling progress update for annual report

*To be met by February 2016*

#### B. Measurable Project Tasks for FY 15

No substantive changes are proposed.

##### **FY 15, 1st quarter (February 1, 2015 - April 31, 2015)**

*February: Complete first set of draft sub models*

*May: Elicit stakeholder input on management objectives*

##### **FY 15, 2nd quarter (May 1, 2015-July 30, 2015)**

*July: Complete data visualization tools for sub models*

##### **FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)**

*October: Design draft sub models focusing on selected management applications*

##### **FY 15, 4th quarter (November 1, 2015- January 31, 2016)**

*November: Elicit input at the annual PI meeting for iterative updating of conceptual ecosystem models.*

*November: Continue elicitation of input from PIs on priorities for monitoring using structured decision support tools.*

January:

*Draft manuscript describing hierarchical development of conceptual models: general ecosystem model, meso-scale sub models, focused management objectives model*

**V. PROJECT PERSONNEL – CHANGES AND UPDATES**

No changes have been made.

**VI. BUDGET**

**A. Budget Forms (Attached)**

Please see included program workbook for budget forms.

**B. Changes from Original Proposal**

None Proposed

**C. Sources of Additional Funding**

N/A