EVOS PROPOSAL SUMMARY PAGE

(Trustee council use only)
Project No. 040556__
Cluster _____
Date Received _____

Project Title: High Resolution Mapping of the Intertidal and Shallow Subtidal Shores in Kachemak Bay

Project Period: 6/1/04 to 12/31/04

Proposer: W. Scott Pegau
Kachemak Bay Research Reserve
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EVOS Funding: Received in FY 02: $62,200
Received in FY 03 $33,600
Requested in FY04 $15,000

Matching Funds: $15,000

Study Location: Kachemak Bay/Lower Cook Inlet

Trustee Agency: ADF&G

ABSTRACT

This is a continuation of the field-mapping project started in FY02 by Dr. G. Carl Schoch. This proposal seeks funding to complete the field mapping and building a database of the geomorphology and physical attributes of shallow intertidal habitats for the Kachemak Bay area. We regard this as the foundation for developing a monitoring program to detect changes in nearshore communities resulting from shifts in watershed and marine processes. Other map tools such as the NOAA Environmental Sensitivity Index (ESI), and the Shore-zone Classification were developed for oil spill response planning and do not contain the data necessary for resolving small spatial scale features of the shoreline needed in ecological studies where biophysical linkages often occur at scales of less than one meter.

I. **INTRODUCTION**

This proposal was funded by the EVOS Trustee Council late in the 2002 fiscal year. The project was led by Dr. Carl Schoch who left the Kachemak Bay Research Reserve in October 2003. Much of the mapping work conducted in the 2003 field season required his expertise to complete, however much of the original mapping effort was conducted using a more stringent set of protocols that led to data sets that were easier to quality control. At this time about 80% of the Kachemak Bay shoreline has been mapped using the more stringent protocols (Figure 1). This work has been entered into a GIS mapped project and into a database. We are requesting funding to complete the work using the more stringent protocols. The remaining work consists of field mapping the remaining 15% of the shoreline, data entry, and GIS database development. Now that the database is set up and the GIS project relatively mature we will be able to complete the work in a single field season using a two-person crew.

II. NEED FOR THE PROJECT

A Statement of Problem

The ecology of the nearshore benthos (from intertidal to 10 m depth) has been studied in detail at many coastal locations in the U.S. However, the processes that couple the intertidal regions with those in the nearshore ocean are poorly understood. For example, it is not apparent if production in some intertidal communities is regulated by the delivery of nutrients from the coastal ocean or by drainage from nearby rivers and estuaries. Such “edge” communities at the transition between one regime and another have rarely been studied as an integrated system. However, it is clear that there is strong physical and biological coupling between the nearshore and the intertidal. Prediction of how these communities will change over time or space is still a significant challenge. Map data of dominant habitats, as well as statistics about spatial frequency and abundance, are important to our understanding of how these systems interact and function and have many applications in resource management as well as basic research. Such understanding is especially critical as we try to make predictions about impacts of large-scale environmental phenomena, from coastal eutrophication, to oil spills, to shifts in weather patterns and wind driven processes (ENSO and global climate change).

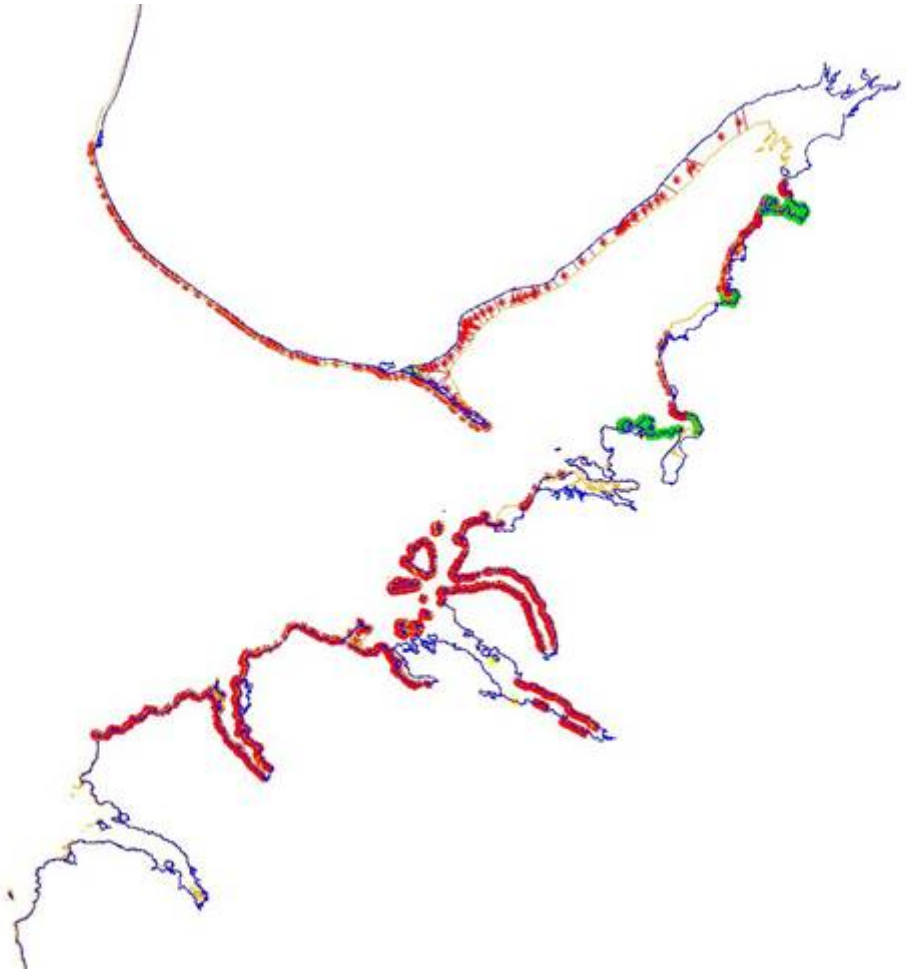

Figure 1. Map of the completed habitat characterization. Areas with red dots have data and photographs. Areas with green dots indicate areas with photographs but no data. Blue lines without dots are regions that must be completed. Salt marshes are being surveyed by a different projects and will fill in large areas at the head of bays and in the Fox River Flats region.

B. Rationale/Link to Restoration

In establishing the GEM Program, the Trustee Council explicitly recognized that complete recovery from the oil spill may not occur for decades and that full restoration of injured resources will most likely be achieved through long-term observation and, as needed, restoration activities. The Council further recognized that conservation and improved management of injured resources and services will require substantial ongoing investment to improve understanding of the marine and coastal ecosystem that supports the resources, as well as the people, of the spill region. In addition, prudent use of the natural resources of the spill area without compromising their health and recovery requires increased knowledge of critical ecological information about the northern Gulf of Alaska. This knowledge can only be provided through a long-term monitoring and research program that will span decades, if not centuries.

C. Link to GEM Program Document

Habitat mapping was one of the key components of the Nearshore monitoring strategy identified at a series of workshops sponsored by the EVOS trustee Council.

III. PROJECT DESIGN

A. Objectives

Our objective is to produce a high-resolution database of nearshore habitats in Kachemak Bay.

B. Procedural Methods

The proposed shoreline partitioning model relies on quantifying physical features known to have direct and indirect ecological responses, and uses these as criteria for partitioning complex shorelines into a spatially nested series of homogeneous segments. For example, at small spatial scales the quantified geophysical parameters include sediment grain size, wave energy, substrate dynamics, and sediment chemistry. At larger spatial scales water chemistry attributes such as salinity, chlorophyll and nutrient concentrations are used. These nested segments can be used to study between-segment and within-segment physical variability, which in turn will support studies of the biotic and abiotic processes that control variability in community structure. This nested segmentation approach allows large areas of shoreline to be classified based on relatively limited *in situ* sampling. The results of Dr. Schoch in Alaska (Lake Clark, Kenai Fjords, Katmai and Glacier Bay National Parks) have shown this to be a robust approach, despite the enormous complexity of these regions. An additional use of this database has recently been developed through an Olympic Coast National Marine Sanctuary initiative to establish a marine reserve network on the outer Washington coast.

This project will take place in Kachemak Bay: the north shore from Anchor Point to the Fox River, then the south shore from Fox River to Pt. Pogibski. The remaining region to be mapped is along the southern shore (Figure 1). The proposed work focuses on intertidal areas other than salt marshes. The salt marshes are currently being mapped under another project and the GIS product will be modified in the future to include that information.

Homogeneous alongshore segments (10-100 meters in length) are delineated and the physical component of the habitat characterized by using indices of geophysical variables within each of four intertidal zones. Indices of the presence of common biological communities within each intertidal zone are also to be logged. The four intertidal zones are low, low-mid, high-mid, and high with Mean Lower Low water as the bottom of the low zone. Mapping will occur during times with a tide of plus two feet or lower. Each alongshore segment will be marked on aerial photographs of the beach, and later the

segment lines will be incorporated into the GIS project. We will photograph each segment and link the photos with the shoreline segment in the GIS project. The datasheets of physical and biological characteristics are to be entered into an Access database that is also linked to the segments in the GIS project. Because we will be able to complete field work half of the time at most, we expect that the data entry portion of this project will be completed during the times we are unable to work in the field.

C. Statistical Methods

The proposed project is a data compilation and inventory of beach types. Statistical power to detect a change does not apply at this stage, however, future work will show the statistical rigor that can be generated when this database is used to identify replicate shore segments.

D. Description of Study Area

This project will take place in Kachemak Bay: the north shore from Anchor Point to the Fox River, then the south shore from Fox River to Pt. Pogibski.

E. Coordination and Collaboration with Other Efforts

We are coordinating this project with ADFG Commercial and Sport Fish Division projects in Kachemak Bay focusing on clam bed research, with the Cook Inlet RCAC to map beaches for oil spill response planning, with The Nature Conservancy to map important conservation areas, and with the City of Homer to map high use beaches for potential land use zoning.

IV. SCHEDULE

A. Project Milestones and Endpoints

The project milestones are to synthesize complete the high-resolution mapping of nearshore habitats in Kachemak Bay, complete the relational database of all the acquired nearshore attributes, and complete the GIS database of raster imagery and vector coverages to represent the nearshore habitat segmentation.

B. Measurable Project Tasks

We intend to resume this project as soon as we are notified of a successful proposal. We anticipate 6 additional tide series (3 months) to complete the field data collection. An additional three months are requested to allow the principal investigator time to complete quality checks of the data and writing the final report.

September 2004	complete all field and data entry work
December 2004	submit final report

V. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

A. Community Involvement and Traditional Knowledge (TEK)

The KBRR is an integrated research and education program. A goal of the KBRR education program is to provide for community involvement and conduct educational programs that will interpret and instruct the public on research projects conducted in the region. The KBRR will interpret research results by the following means:

- The KBRR web page;
- The KBRR interactive research and education programs;
- Conferences, workshops, and presentations on our programs to the community and schools;
- Display information on research projects at the new KBRR facilities in the Alaska Islands and Oceans Visitor Center.

B. Resource Management Applications

The project will benefit all the resource management agencies in the Bay, oil spill advisory councils, conservation agencies, and local governments (see letters of support submitted with the original proposal). The communities include the City of Homer and greater Homer area, Anchor Point, Seldovia, and the many small unorganized communities on the south shore or Kachemak Bay (e.g. Halibut Cove, Jakalof Bay, Bear Cove). Immediate resource management applications include using the database to quantify clam habitat to improve estimates of abundance. The database will also be used to quantify juvenile rockfish habitat and determine shores at risk to oilspills and other development related stressors.

VI. PUBLICATIONS AND REPORTS

The product of this work is regarded as the foundation for further monitoring of the biological components of the ecosystem. As such, we do not expect to publish this data in a scientific journal until the biological data has also been collected and analyzed.

VII. PROFESSIONAL CONFERENCES

The principal investigator is professionally obligated to present the results of Kachemak Bay research projects at the annual NERRS Research Conference (travel funded by NOAA).

VIII. PERSONNEL

A. Principal Investigator (PI)

Dr. W. Scott Pegau
Kachemak Bay Research Reserve
95 Sterling Hwy, Suite 2
Homer, AK 99603
907-226-4654
907-235-4794
scott_pegau@fishgame.state.ak.us

B. Other Key Personnel

This grant will provide support for a GIS Analyst and a Research Assistant for field support, data entry, and analysis.

C. Contracts

IX. PRINCIPAL INVESTIGATOR QUALIFICATIONS

W. Scott Pegau
Research Coordinator, Kachemak Bay Research Reserve
Professional Preparation:

University of Alaska, Fairbanks	Physics	B.S./1990
Oregon State University	Oceanography	Ph.D./1996
Oregon State University	Oceanography	Post doc./1996-1997

Appointments:

Senior Scientist, Kachemak Bay Research Reserve (KBRR)	2002-present
Assistant Professor (tenure track), Oregon State University	1999-present
Faculty Research Associate, Oregon State University	1997-1999
Faculty Research Associate (Post Doc), Oregon State University	1996-1997
Graduate Research Assistant, Oregon State University	1990-1996
Research Assistant, University of Alaska, Fairbanks	1987-1990

Current duties:

Current duties at KBRR include being the Research Coordinator, maintaining and expanding the in-situ monitoring program, and developing new research programs examining the circulation and primary production in Kachemak Bay and Lower Cook Inlet. As Research Coordinator, I coordinate KBRR research with other research being

conducted within the Reserve boundaries, such as the taxonomic work being performed by Drs. Konar and Eiken.

Expertise:

My primary area of expertise is the interpretation of in-situ and remote optical measurements to determine types of materials in the water column, determination of vertical distributions from space, water masses, and circulation patterns. I have extensive experience in the conceptual design and deployment of sensors on a number of platforms ranging from traditional cages, ferry vessels, and autonomous vehicles. I also have experience determining heat fluxes using meteorological and oceanographic measurements.

5 recent or significant publications:

Pegau, W. S., Inherent optical properties in the Central Arctic surface waters, in press *J. Geophys. Res.* (in press)

Pegau, W. S., E. Boss, and A. Martinez, Ocean color observations of eddies during the summer in the Gulf of California, *Geophys. Res. Lett.,* **29**, 10.1029/2001GL014076, 2002.

Weideman, A. D., D. J. Johnson, R. J. Holyer, W. S. Pegau, L. A. Jugan, and J. C. Sandidge, Remote imaging of internal solitons in the coastal ocean, *Remote Sensing of Environment,* **76**, 260-267, 2001.

Twardowski, M. S., E. Boss, J. B. MacDonald, W. S. Pegau, A. H. Barnard, J. R. V. Zaneveld, A model for estimating bulk refractive index from the optical backscattering ratio and the implications for understanding particle composition in case I and case II waters, *J. Geophys. Res.,* **106**, 14129-14142, 2001.

Zaneveld, J. R. V., and W. S. Pegau, A model for the reflectance of thin layers, fronts, and internal waves and its inversion, *Oceanography*, **11**, 44-47, 1998.

X. LITERATURE CITED

See original FY02 proposal

***EXXON VALDEZ* OILSPILL TRUSTEE COUNCIL**
PROJECT BUDGET

Budget Category:	Proposed FY
Personnel	$12.3
Travel	$0.0
Contractual	$1.0
Commodities	$0.5
Equipment	$0.0
Subtotal	$13.8
General Administration	$1.2
Project Total	$15.0
Other Funds	

Comments:

FY04

Prepared:

Project Number: 040556
Project Title:High Resolution Mapping of the Intertidal and Shallow Subtidal Shores in Kachemak Bay
Agency: Alaska Dept. of Fish and Game

***EXXON VALDEZ* OILSPILL TRUSTEE COUNCIL**
PROJECT BUDGET

Personnel Costs:		GS/Range/	Months	Monthly	
Name	Description	Step	Budgeted	Costs	Overtin
Fish and Wildlife Tech III	Fish and Wildlife Tech III	11A	3.5	3.5	
	Subtotal		3.5	3.5	0
					Personnel To

Travel Costs:	Ticket	Round	Total	Da
Description	Price	Trips	Days	Per Die
				Travel To

FY04

Prepared:

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Contractual Costs:

Description
Boat fuel and maintenance

When a non-Trustee organization is used, the 4A and 4B forms are required. **Contractual To**

Commodities Costs:

Description
field notebooks, digital camera

Commodities Tot

FY04

Prepared:

Project Number: 040556
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Agency: Alaska Dept. of Fish and Game

***EXXON VALDEZ* OILSPILL TRUSTEE COUNCIL**
PROJECT BUDGET

New Equipment Purchases:	Number of Units	U Pri
Description		
Indicate replacement equipment purchases with an R.		**New Equipment To**

Existing Equipment Usage:	Numb of Un
Description	

FY04

Prepared:

Project Number: 040556
Project Title: High Resolution Mapping of the Intertidal and Shallow Subtidal Shores in Kachemak Bay
Agency: Alaska Dept. of Fish and Game