

22.06.01

October 15, 2003

Briefing Materials

GEM Science Plan
FY 04 Invitation
FY 04 Work Plan

October 15, 2003

From Phil Mundy

To Trustee Council

CC Gail Phillips

Re GEM Program Introduction

The following is an outline of my oral presentation for your reference during and after my talk

- 1 What is GEM and how is it different from what we already have?**
- 2 Why should the Exxon Valdez Oil Spill Trustee Council be spending its money on GEM?**
- 3 Are we ready to implement GEM now?**

Steps taken to get ready -

- **Producing the first draft August 1999 – April 2000**
 - *Building the GEM network*
 - *Preliminary gap analysis*
- **Developing the NRC review draft May 2000 – July 2001**
 - *Focus groups*
 - *2000 Workshop*
 - *Scientific Background Writers Group*
 - *National Research Council Preliminary Comments*
 - *Public Comment*
- **Adopting the GEM Program Document, August 2001 – July 2002**
- **First steps toward implementation, August 2002 – April 2003**

4 Can we afford to implement GEM and meet our responsibilities for lingering oil studies at the same time?

5 Can individual time series be used for regulatory purposes without an ecosystem context?

Power Point slides follow

GEM Program Overview

**Exxon Valdez Oil Spill Trustee Council Meeting
Anchorage
October 15, 2003**

GEM is an internationally recognized long-term monitoring effort

**Those
who
helped
get GEM
off the
ground
are
many:**

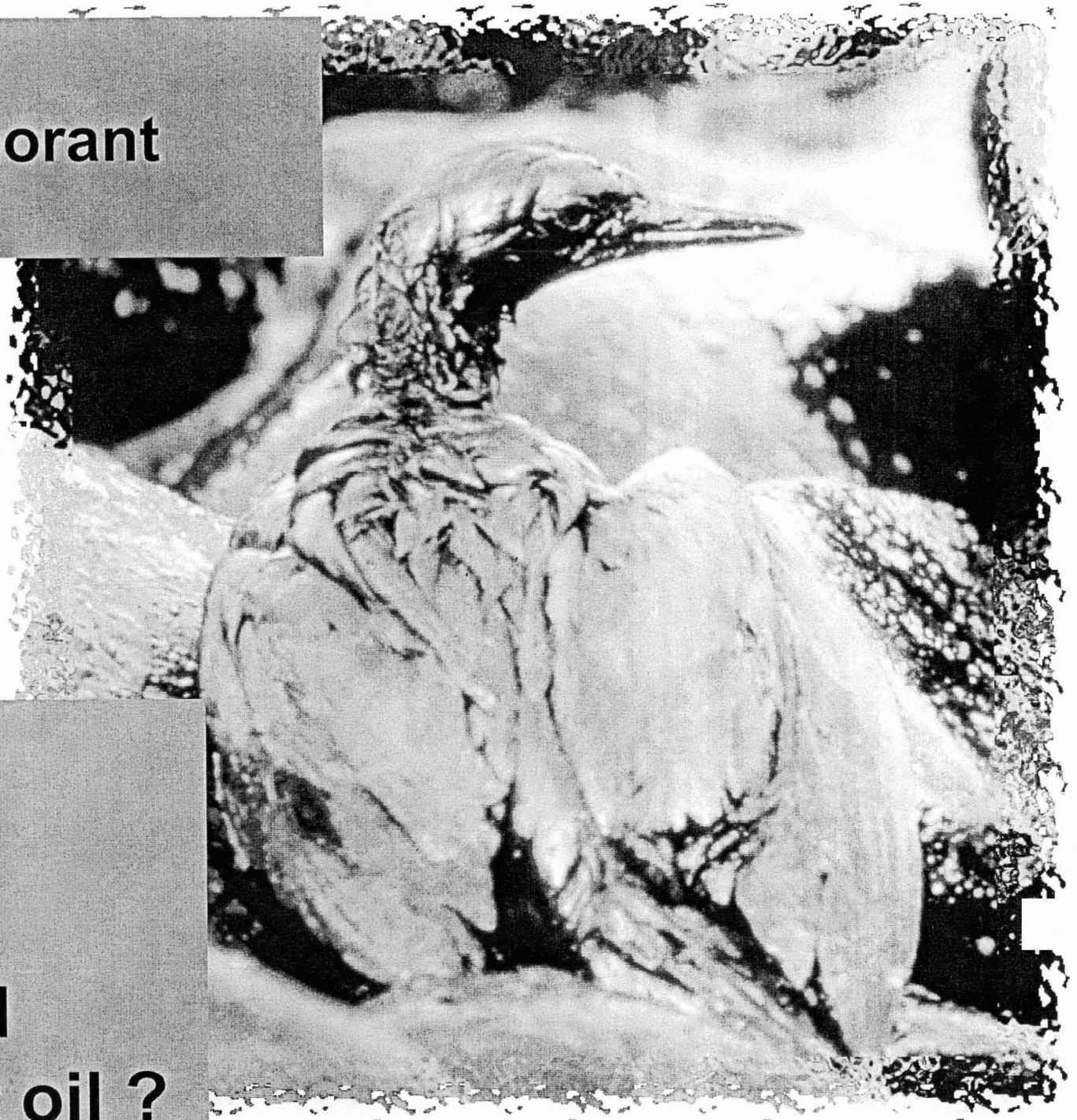
The efforts of the following are gratefully acknowledged: Alisa Abookire, Ken Adams, Vera Alexander, Fried Allendorf, Paul Anderson, Peter Armato, Shannon Atkinson, Jim Ayres, Michael Baffrey, Tom Baker, Kris Balliet, Hal Batchelder, Bill Bechtol, Catherine Berg, Brock Bernstein, Chris Blackburn, Jim Blackburn, John Blaha, Jim Bodkin, Dede Bohn, James Brady, Stephen Braund, Evelyn Brown, Patty Brown-Schwalenberg, Al Buch, Vern Byrd, Robin Carlson, Robert Clark, Dave Cobb, Ken Coyle, Ted Cooney, Seth Danielson, Tom Dean, Robert DeVelice, Jane DiCosimo, Gary Drew, Janet Duffy-Anderson, Doug Eggers, Dave Eslinger, Gary Fandrei, Bob Foy, Steve Frenzel, Carol Fries, Fritz Funk, Dan Gillikin, David Goldstein, Andy Gunther, Gary Gury, Ed Harrison, Bill Hauser, Robert Hennrichs, Ken Holbrook, Anne Hollowed, Brett Huber, Gary Hufford, Charlie Hughey, Dan Hull, Joe Hunt, Henry Huntington, Steve Ignell, David Irons, Lisa Kaarhuue, Tom Kline, Gary Kompkott, Jan Konigsberg, Gordon Kruse, Kathy Kuletz, Pat Lavin, Pat Livingston, Lloyd Lowry, Allen Macklin, Tom Malone, Suzanne Marcu, Richard Marasco, Michael H. Martin, Paul McCollum, Walter Meganack, Jr., Jennifer Nielsen, Gordon Nelson, Pat Norman, Phil North, Worth Nowlin, Peter Q. Olsson, Gretchen Oosterhout, Ted Otis, Paul Panamartoff, Kent Patrick-Riley, Charles Peterson, John Platt, Josie Quintell, Terry Reed, Bud Rice, Stanley Rice, Ivan Richert, Monica Riedel, George Rose, Dave Roseneau, Susan Saupe, Andy Schmidt, Carl Schoch, Sandra Schubert, Marianne See, Stan Senner, Bob Shavelson, Hugh Short, Jeff Short, Claudia Slater, Bob Small, Alan Springer, Stacy Studebaker, Arliss Stulgulewski, Joe Sullivan, Kevin Summers, Gary Thomas, Glenn VanBlaricom, Shari Vaughan, Gale Vicki, Jia Wang, Sarah Ward, Tom Weingartner, Steve Weisberg, David Welch, Kent Wohl, Bruce Wright, and Kate Wynne.

GEM starts with the oil spill ...

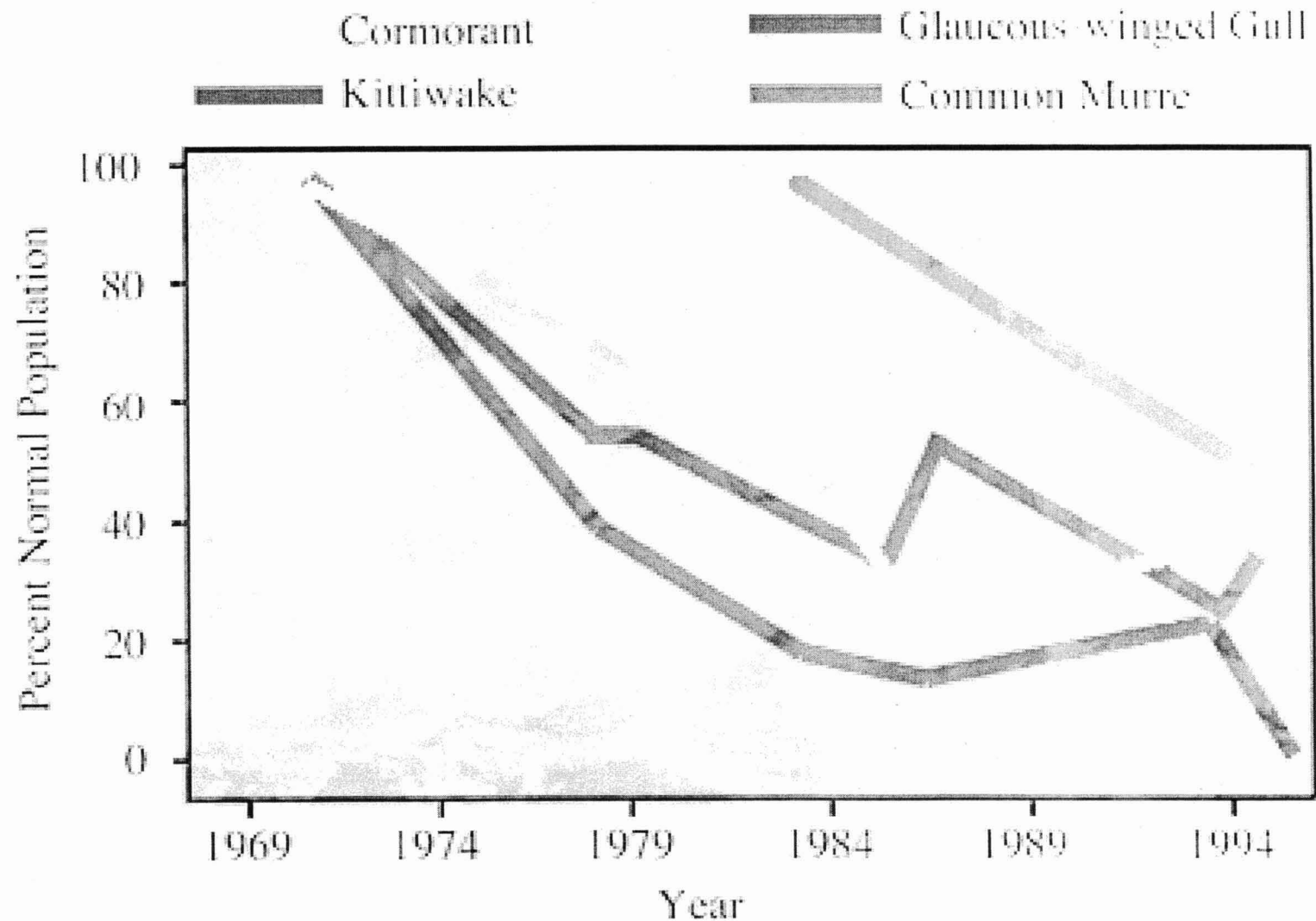
Photo of April 13, 1989 - How can the damages of the oil spill be assessed? What were the injuries? How long will it last? Many questions remain unanswered.

**PWS
Cormorant
1989**

**Numbers of
cormorants
continue to
be depressed
in PWS – is it oil ?**

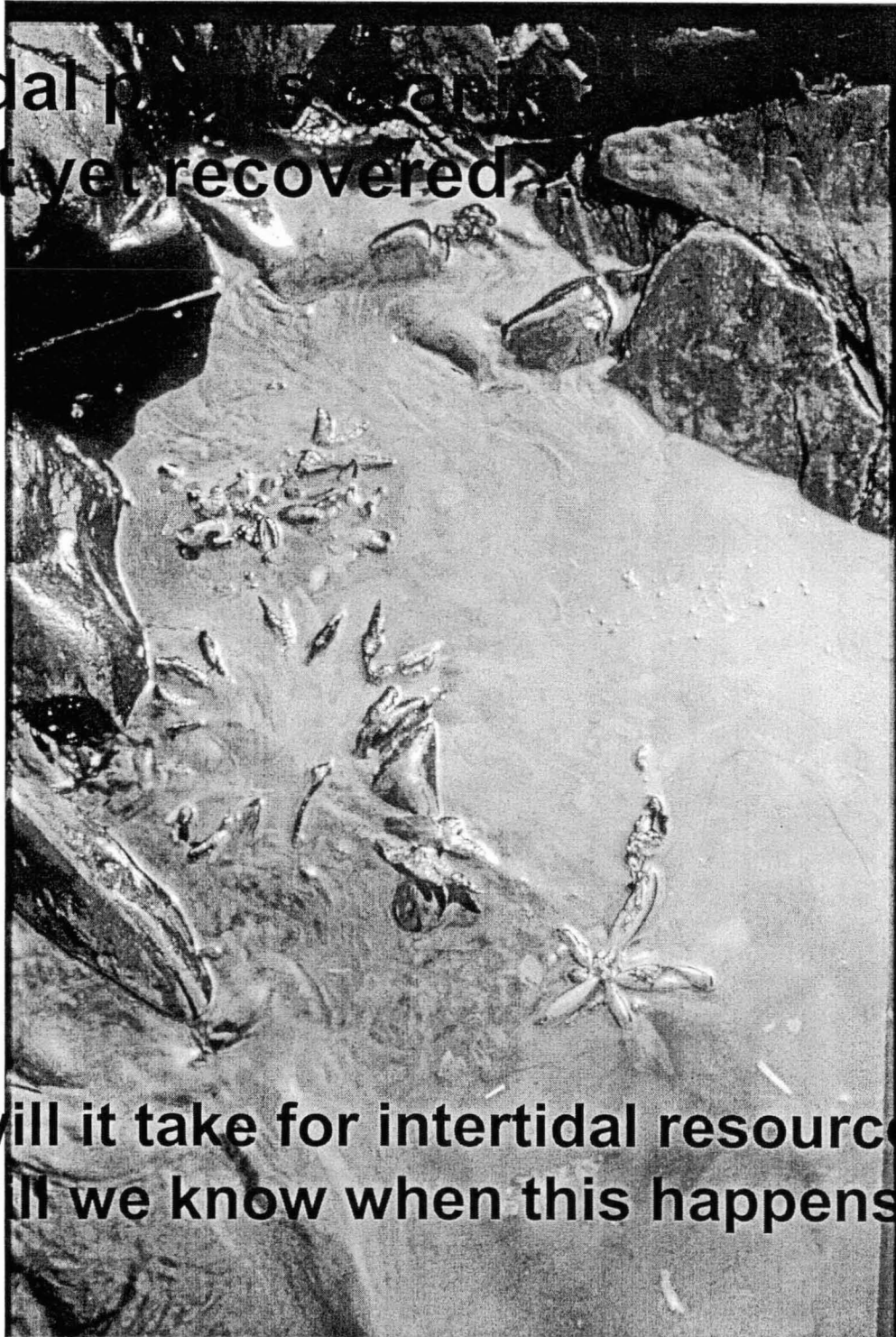


But seabird populations are also declining outside Prince William Sound



Source: Anderson and Piatt, 1996

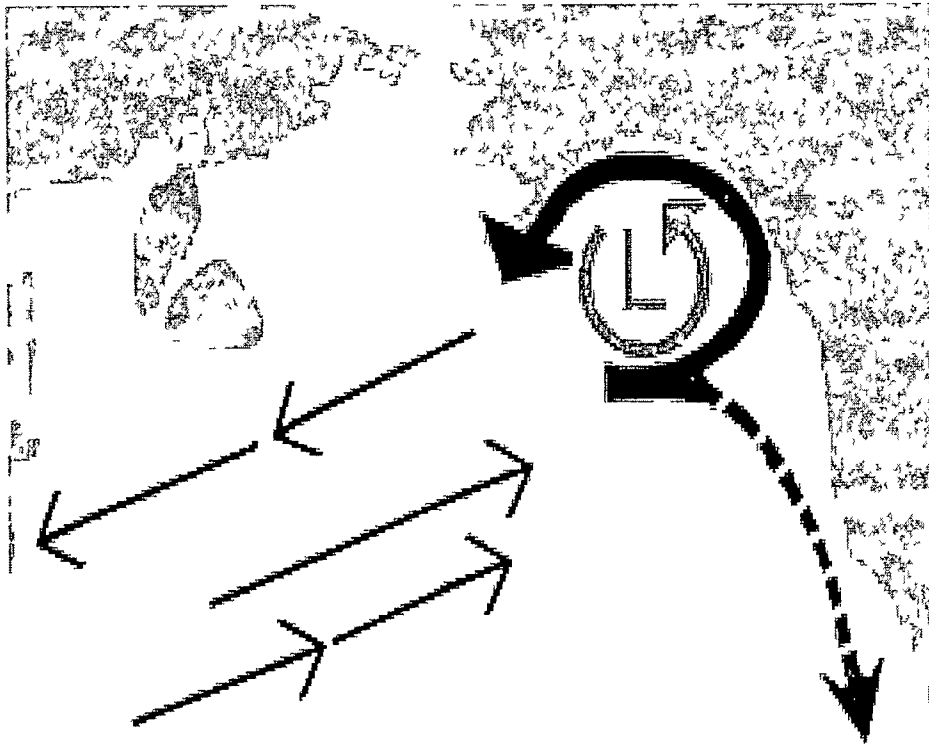
**Intertidal populations
are not yet recovered**



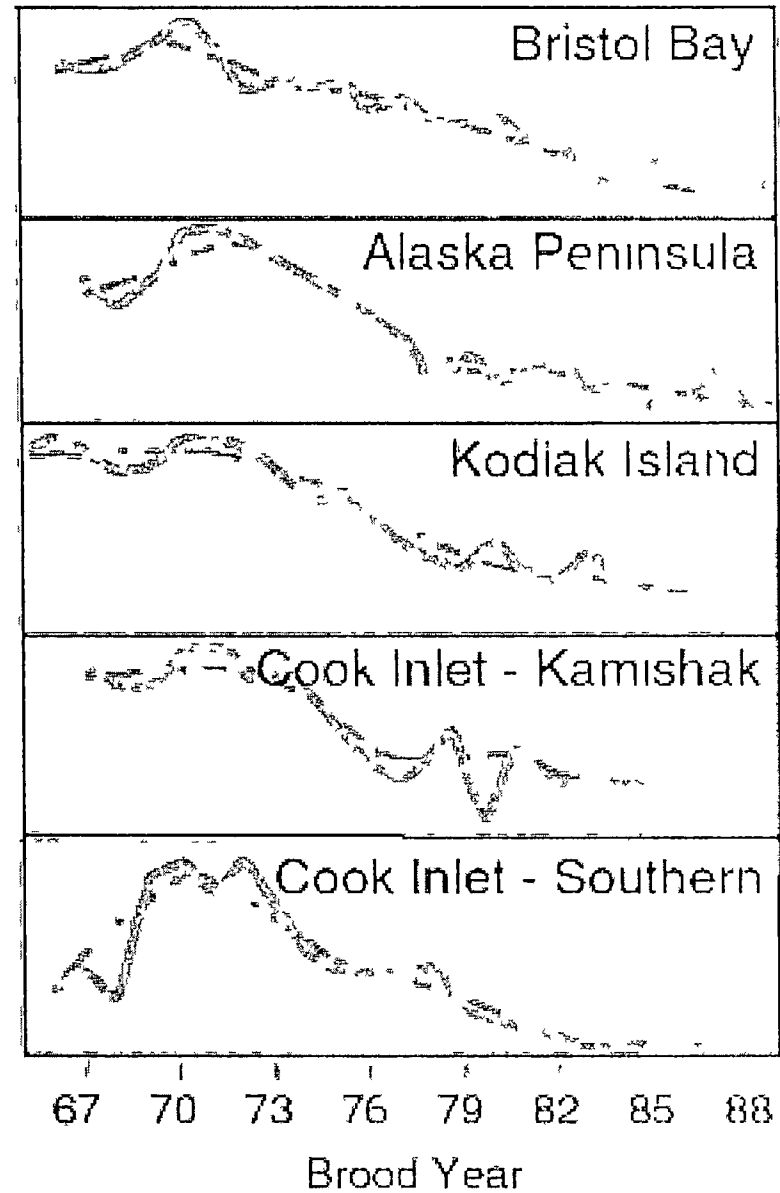
**How long will it take for intertidal resources to recover,
and how will we know when this happens?**



Recruitment of red king crab



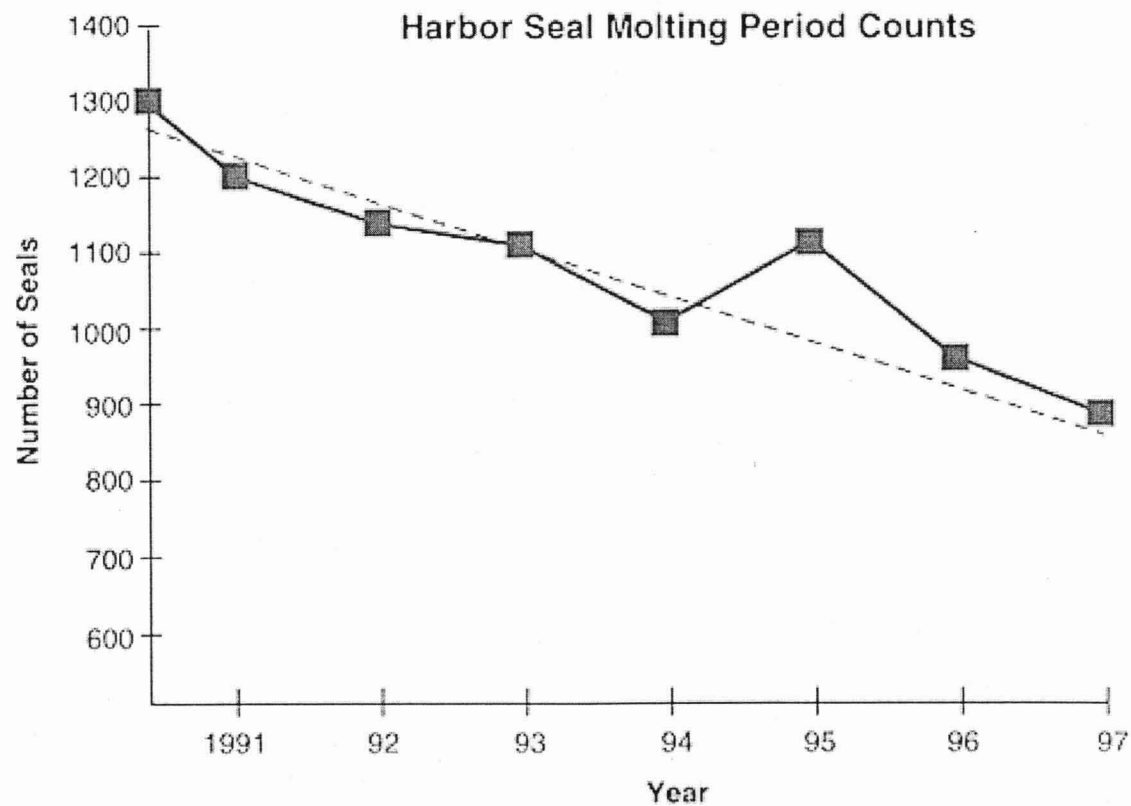
Log (Recruits)



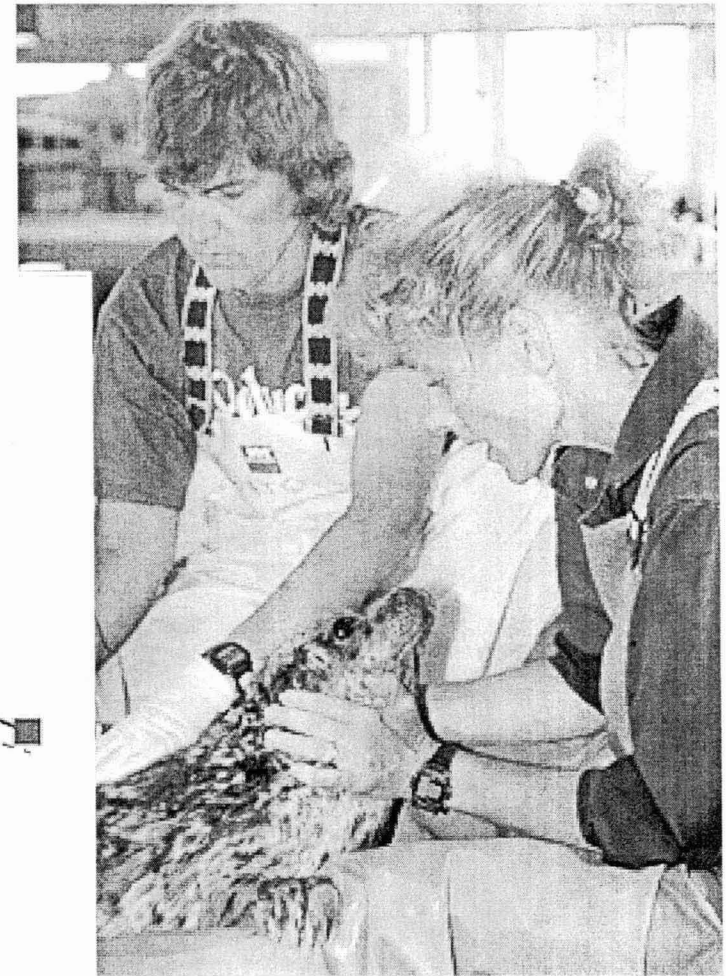
Weather pattern called the “positive PDO” lasts for about 20 years

Source Zheng and Kruse, 2000

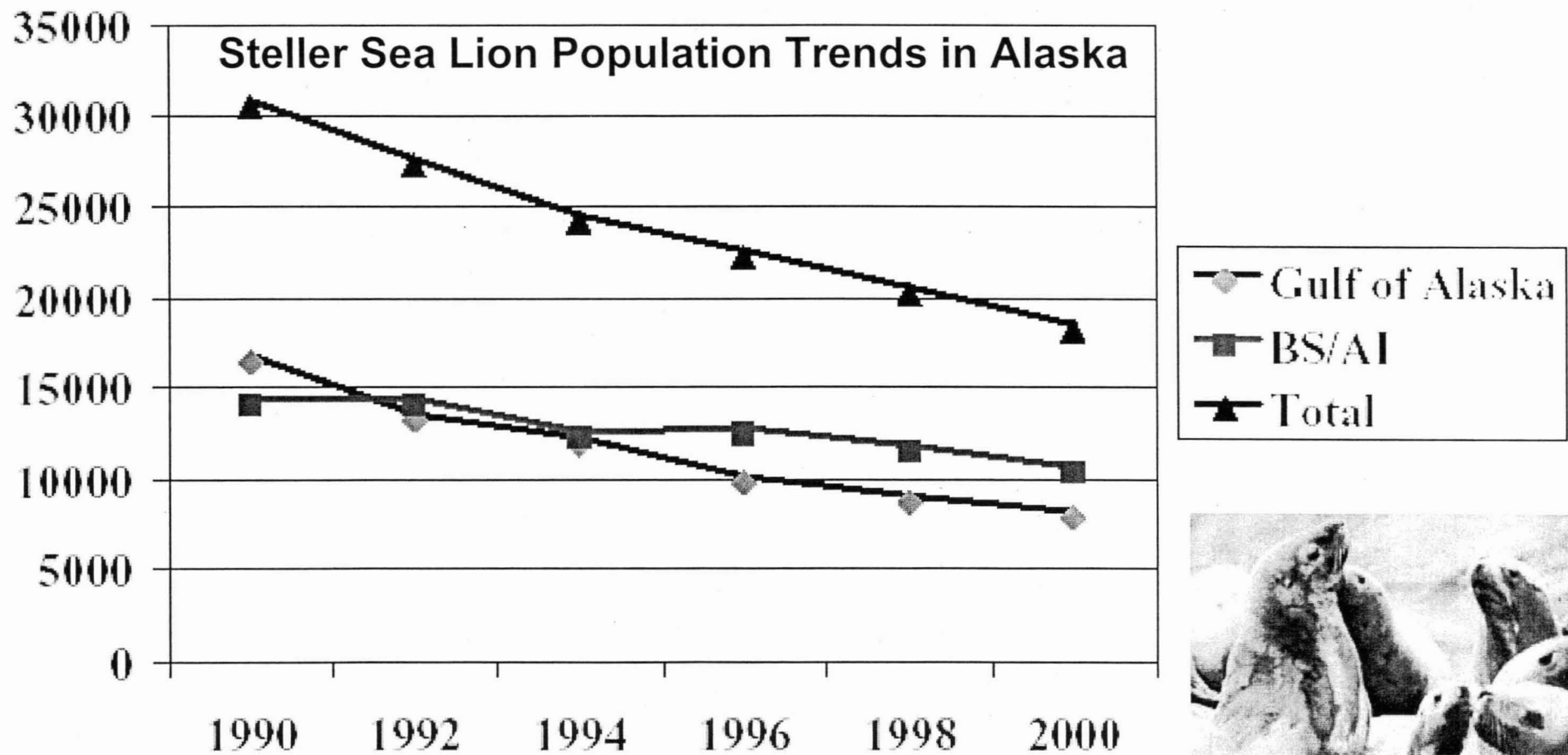
Harbor seals are not recovered in PWS ...



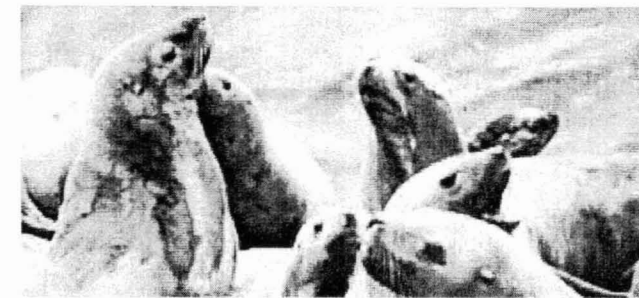
Source: Frost, 1998




But other marine mammal populations also show long downward trends in nearby areas ...



Source: NOAA/NMFS DeMaster 2001

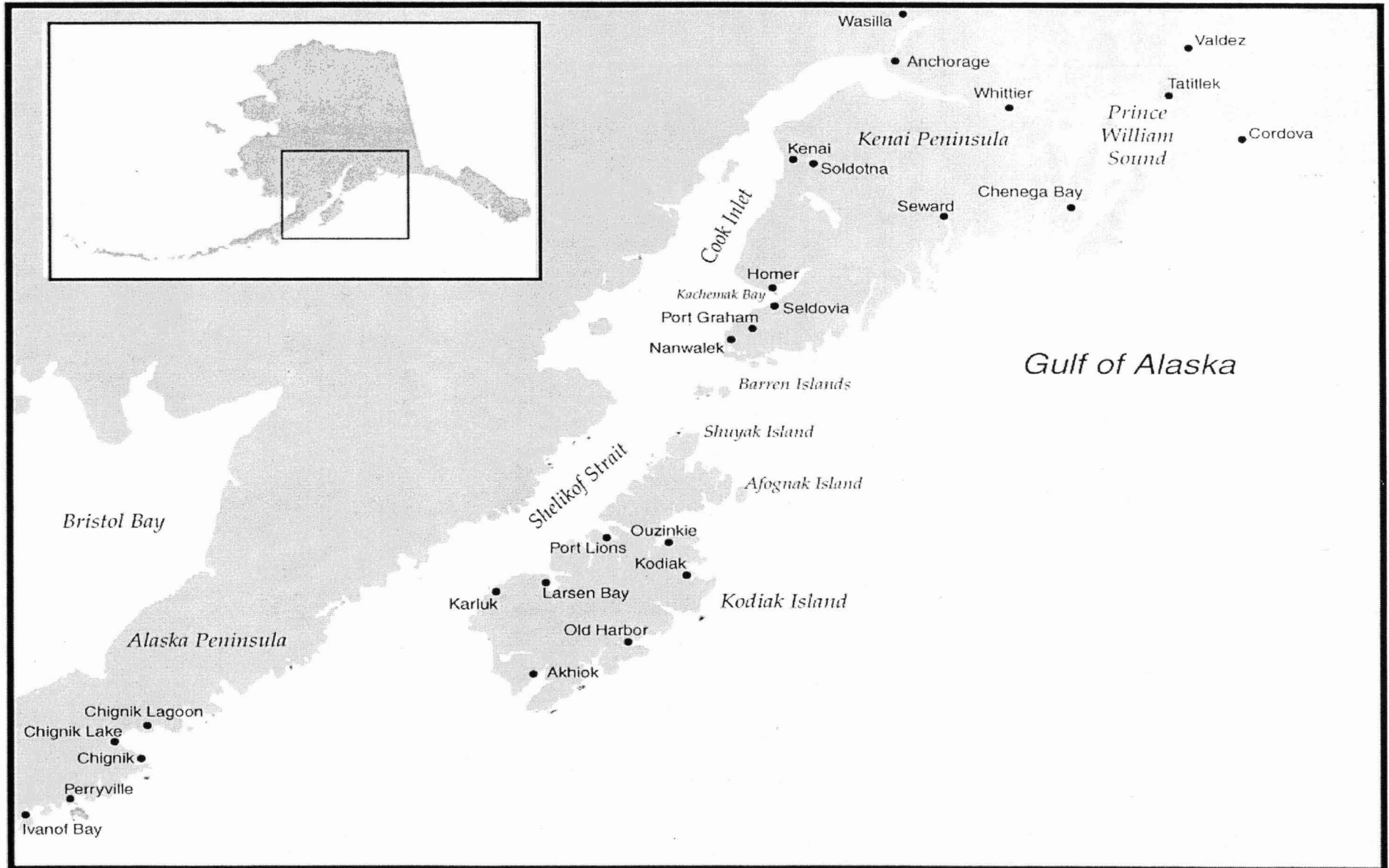


- More than 14 years after the oil spill, how can so many questions remain unanswered?
- Because our abilities to separate human impacts from natural variability are hampered by critical gaps in essential information

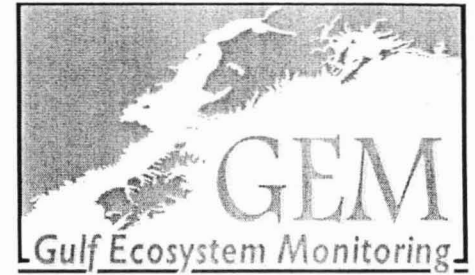
- 
1. Fill data gaps with long-term data sets of physical and biological observations that are essential to detect and understand ecosystem change food webs of seabirds, marine mammals and fish through time.
 2. Human impacts can be distinguished from natural variability by filling in critical gaps in critical long-term biological and physical data sets.
 3. The information can be used to create tools for managers and the public to solve resource management problems.

- The GEM Program is designed to place changes in oil spill-injured resources in the context of ecosystem changes caused by other human effects and natural forcing ...
- How this will be done is explained in the GEM Program Document and the Science Plan, which were prepared in response to the Council's mission for GEM ...

Geographic Scope

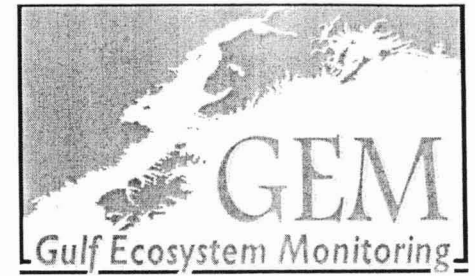


Mission



. . . “to sustain a healthy and biologically diverse marine ecosystem in the northern Gulf of Alaska and the human use of the marine resources in that ecosystem through greater understanding of how its productivity is influenced by natural changes and human activities.”

GEM Goals



- DETECT: Early warning system (top priority)
- UNDERSTAND: Identify causes of change
- INFORM: public, resource managers, industry and policy makers
- SOLVE: Develop tools, technologies, and information to address problems
- PREDICT: status and trends of natural resources (NRC warns this should take longest)

Detect Change and Understand Causes of Change



Early '70s

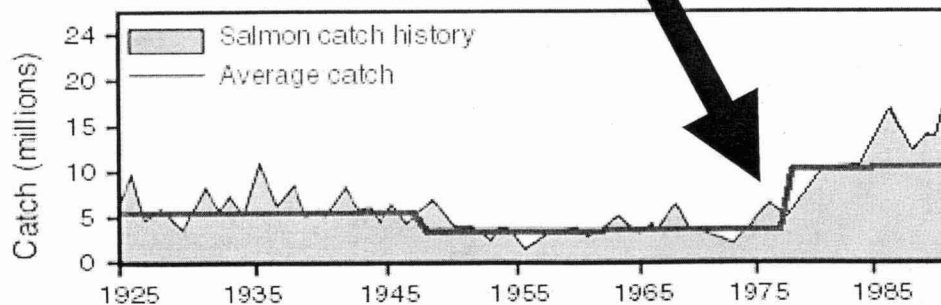
Change has profound
consequences for all
natural resources,

stakeholders
and
managers



Late '70s

SALMON



Central Alaska Sockeye catches

Source: Francis and Hare 1994



1980s-'90s

Sources of ecological change

Natural Causes

Climate

Disease

Predator/Prey

Competition

Earthquakes

Volcanoes

Human Causes

Habitat Loss

Pollutants

- Toxins
- Non-point sources
- Noise

Hunting/Fishing

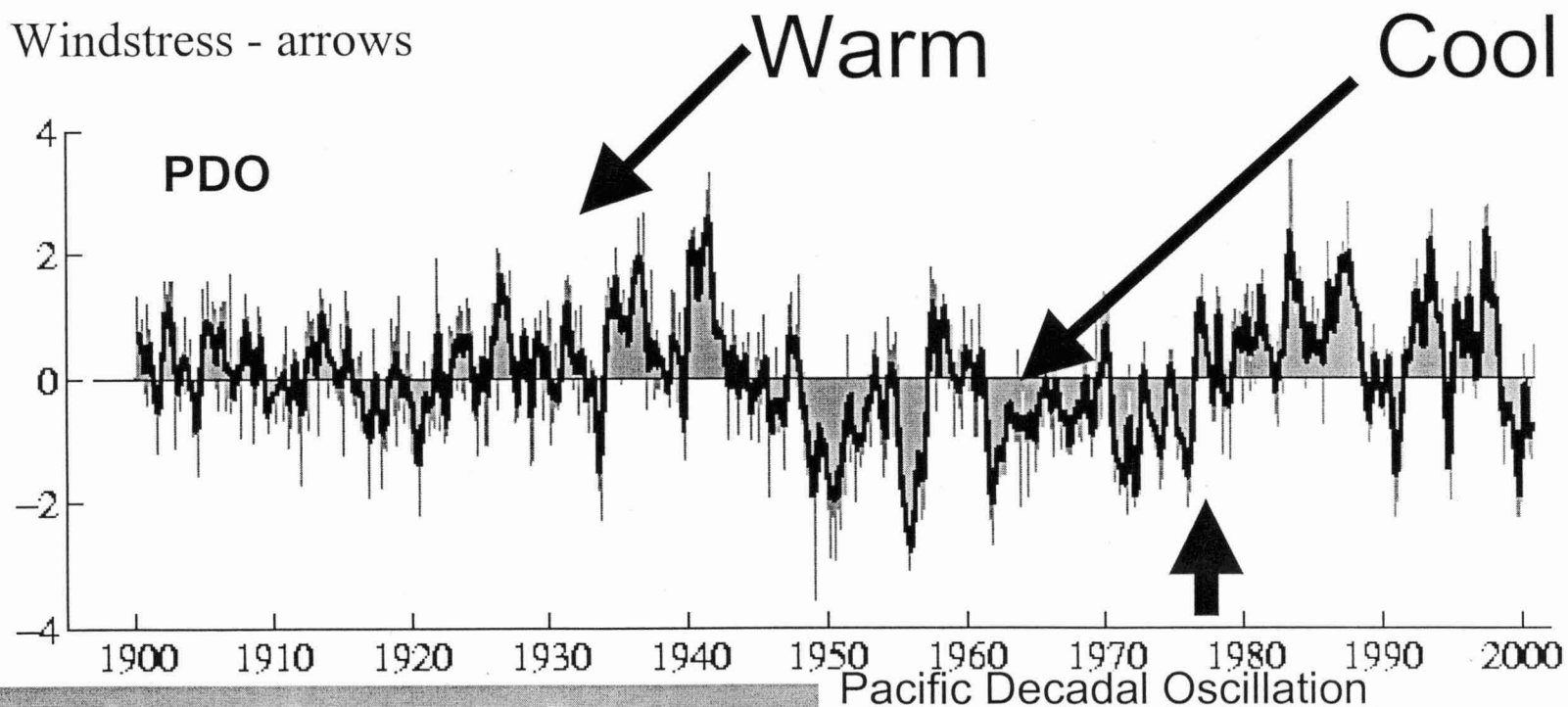
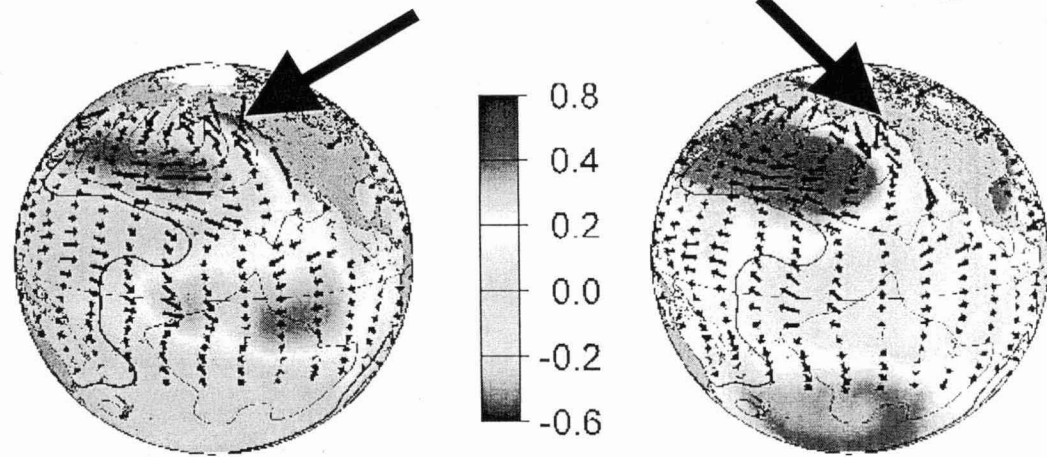
Climate is a major cause of natural change in the GOA

Pacific Decadal Oscill. Anomaly Patterns

SST – colors

SLP – contours

Windstress - arrows



Credits: Hare, Mantua, Enfield

Detect Change and Understand Causes of Change

Not all species respond the same to natural forcing and human effects



Shrimp
Red King Crab
Some Seabirds
Sea Lions
Harbor Seals
PWS Herring



Salmon
Cod
Pollock
Sea Otters
Offshore Plankton

Detect Change and Understand Causes of Change

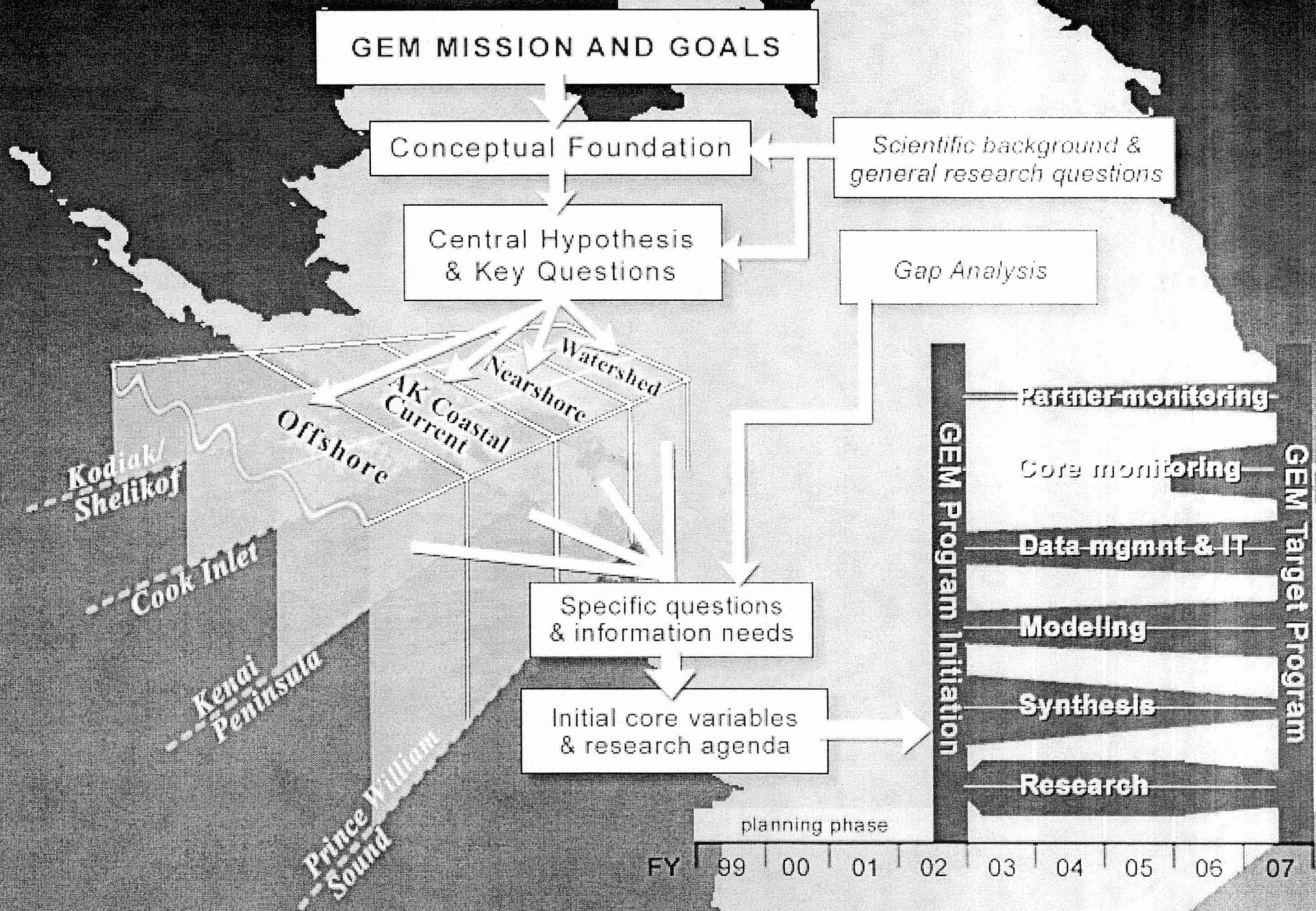
Implementation Goals

- **Lead** the way in integrating, synthesizing, and interpreting monitoring and research results to form and convey a “big picture” of the status of and trends in the GOA ecosystem,
- **Track** work of other entities relevant to understanding biological production in the GOA and **coordinate** GEM with those efforts,
- **Leverage** funds to augment ongoing monitoring work funded by other entities,
- **Involve** other government agencies, non-governmental organizations, stakeholders, policy makers, and the general public in a collaborative process to achieve the mission and goals of GEM,
- **Increase** community involvement and local and traditional knowledge in order to enhance long-term stewardship of living marine resources, and
- **Facilitate** application of GEM research and monitoring results to benefit conservation and management of marine resources

Implementation Strategies

- Community Involvement
- Management Applications

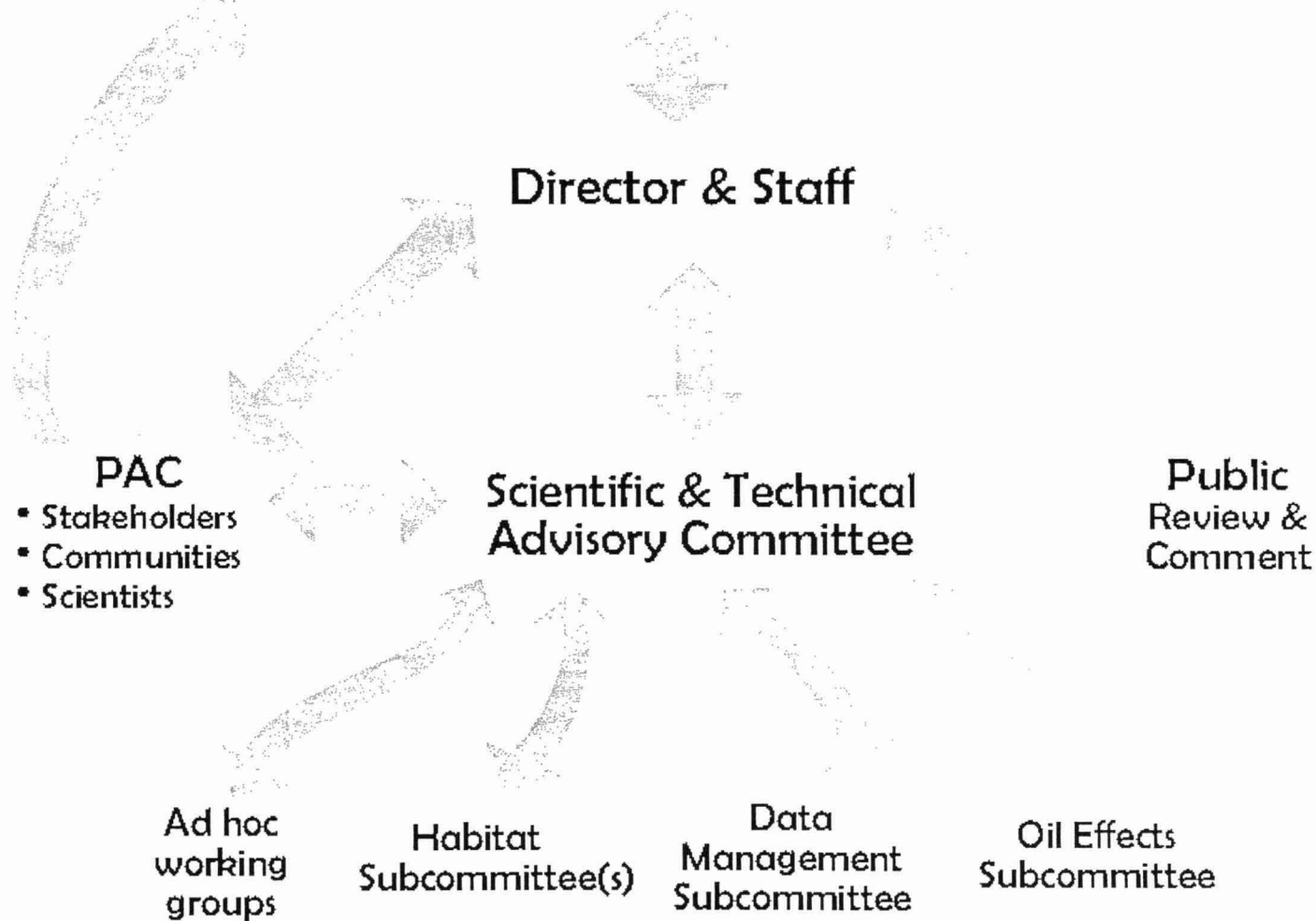
Overview of GEM Program Doc



GEM PROGRAM IMPLEMENTATION

External
Review
Committee
(every 5-10 years)

EVOS Trustee Council



STRATEGIC INFORMATION

Advice:

- Public
- Scientific
- TEK

RESOURCE MANAGEMENT

- State Agencies
- Federal Agencies
- Universities
- Other Marine
Science
Programs

MISSION & GOALS

CONCEPTUAL FOUNDATION

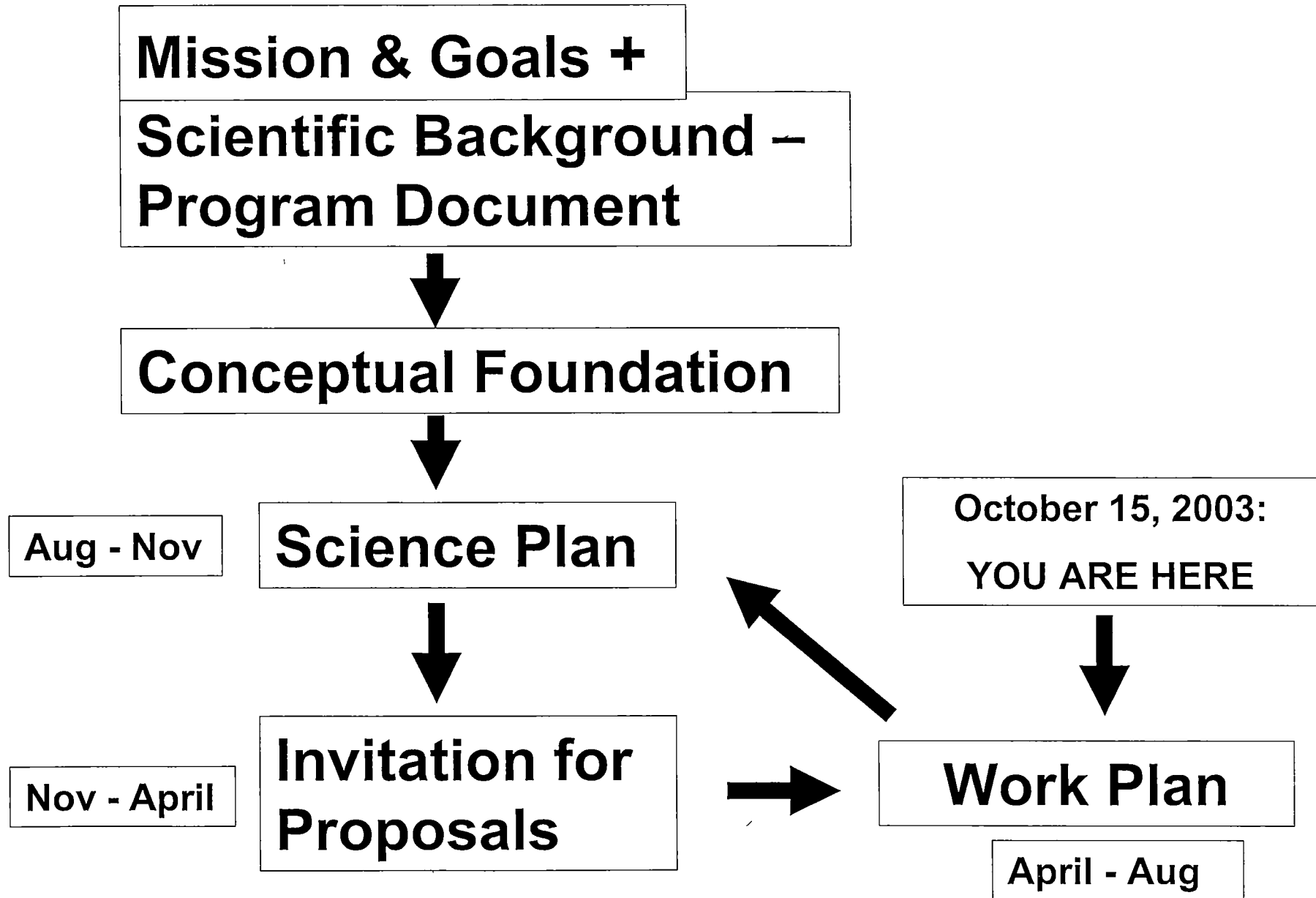
CENTRAL HYPOTHESIS & QUESTION BY HABITAT TYPE

GAP ANALYSIS/SYNTHESIS/RESEARCH/ MODELING/DATA MANAGEMENT

CORE & PARTNERSHIP MONITORING EFFORTS



From the Program Document to the Work Plan ...



- The End of GEM Overview ...

Introduction to the FY 2004 Work Plan

**Exxon Valdez Oil Spill Trustee Council
Meeting**

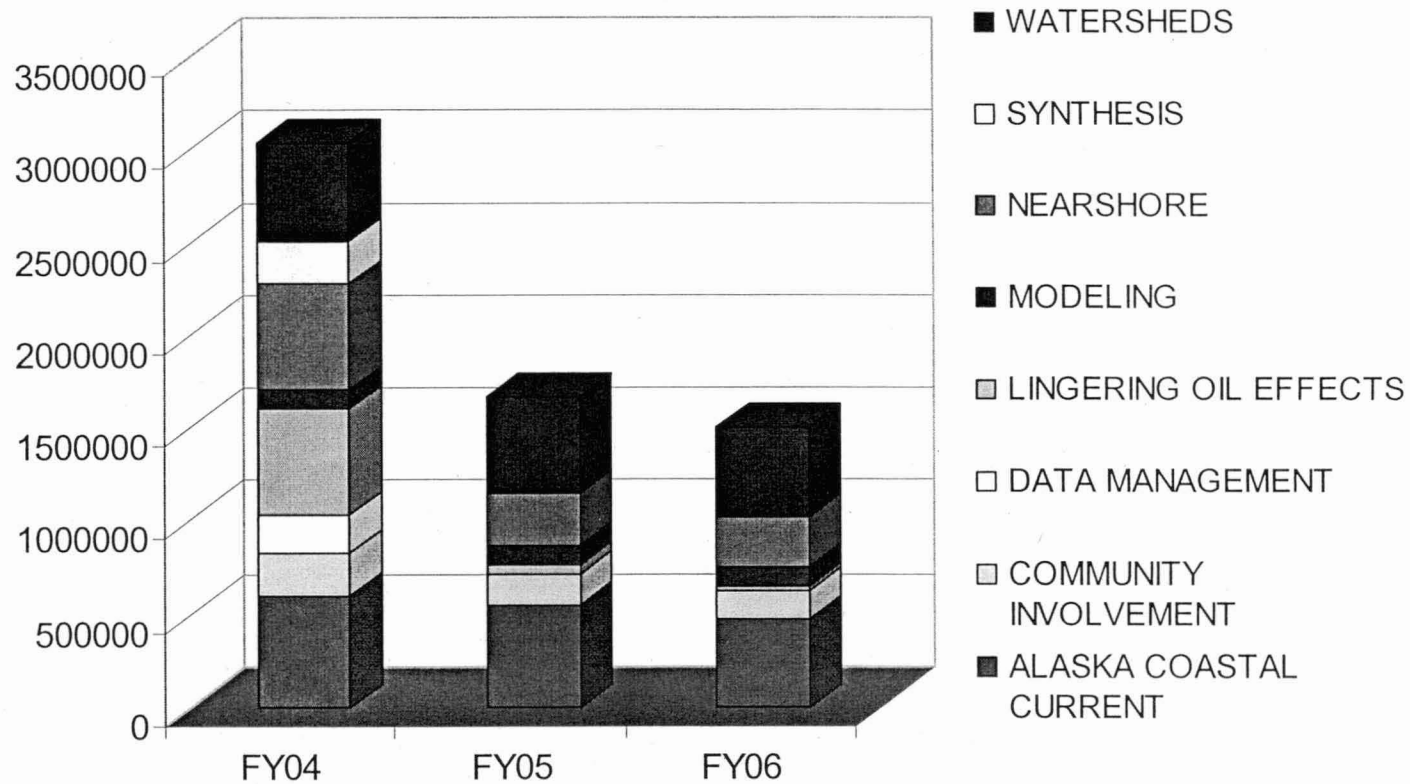
Anchorage

October 15, 2003

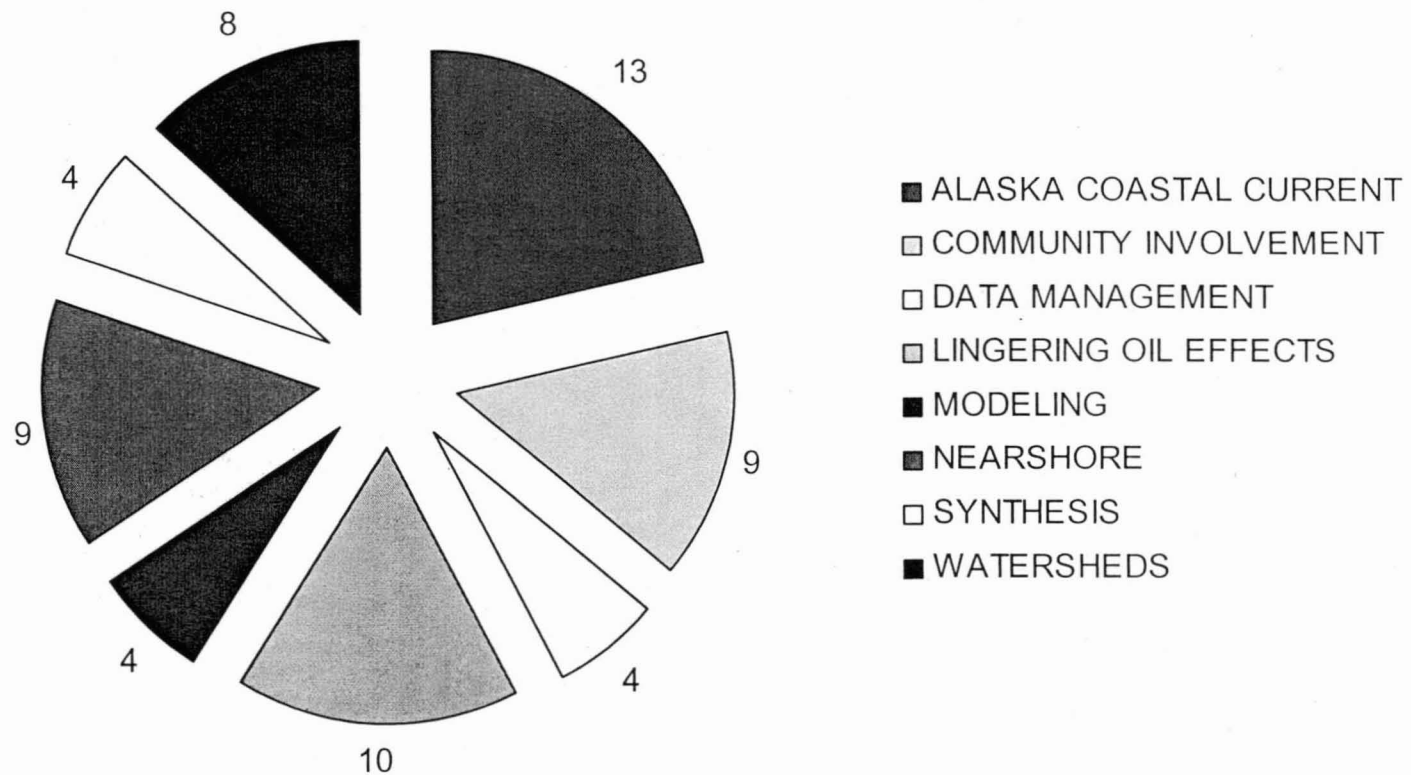
FY04 Budget

EVOS Approved Total	\$1,572,600.00
Projects Recommended For Funding	\$3,051,714.00
Projects Recommended For Funding + EVOS Approved	\$4,624,314.00
<u>Lingering Oil Defer</u>	
Bodkin-FY04-Lingering Oil and Sea Otters	\$134,300.00
Irvine-FY04-Lingering Oil on Boulder-Armored Beaches	\$71,700.00
Rice-FY04-Lingering Population Status	\$60,000.00
Total Lingering Oil Defer	\$266,000.00
Projects Recommended For Funding+ EVOS Approved	\$4,624,314.00
Lingering Oil Defer + Projects Recommended For Funding+ EVOS Approved	\$4,890,314.00
EVOS Pending (Project Management)	\$140,000.00
Lingering Oil Defer + Projects Recommended For Funding+ EVOS (Approved and Pending)	\$5,030,314.00
Total Defers From Non-Lingering Oil	\$1,073,434.00
Grand Total -All Defers + Projects Recommended For Funding+ EVOS (Approved and Pending)	\$6,103,748.00

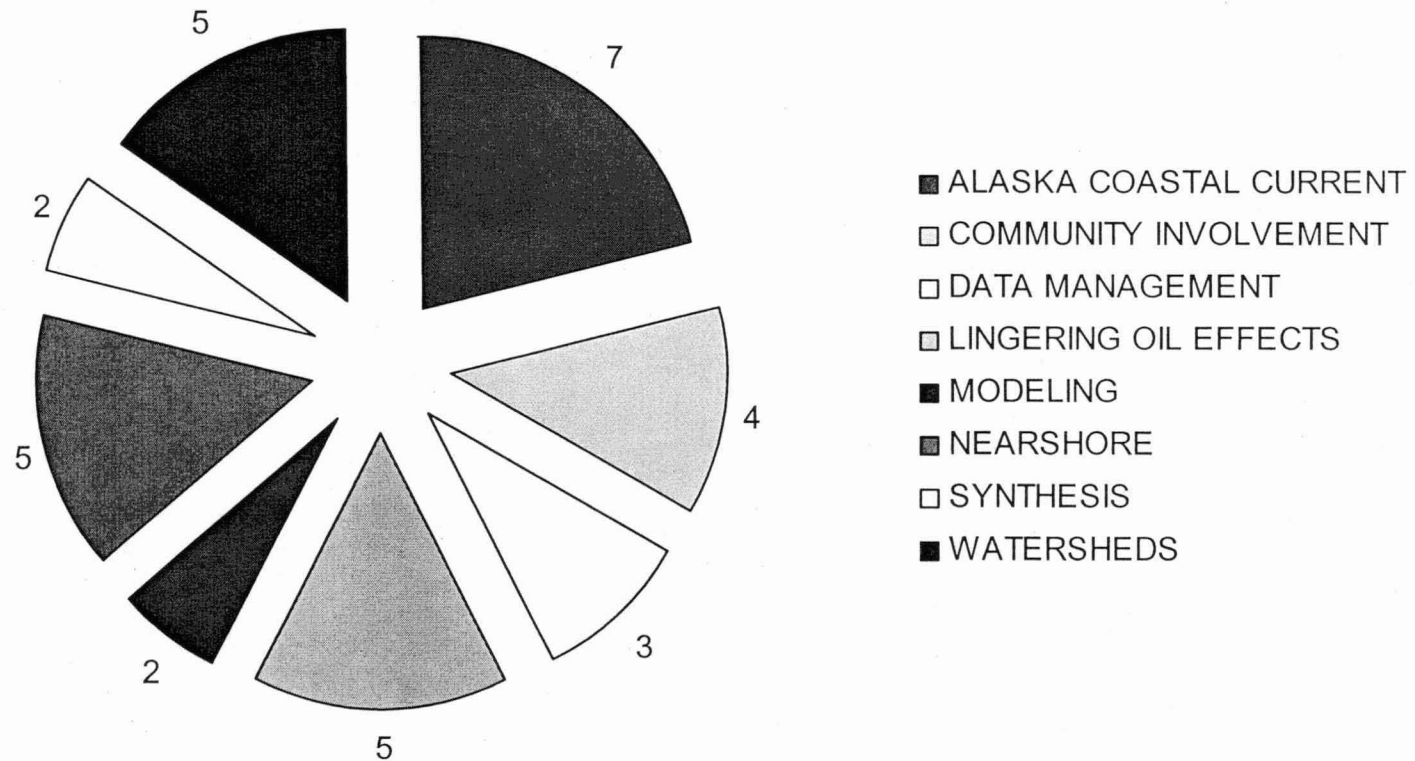
Yearly Recommended Funding (Fund + Fund Contingent) per Invitation Category



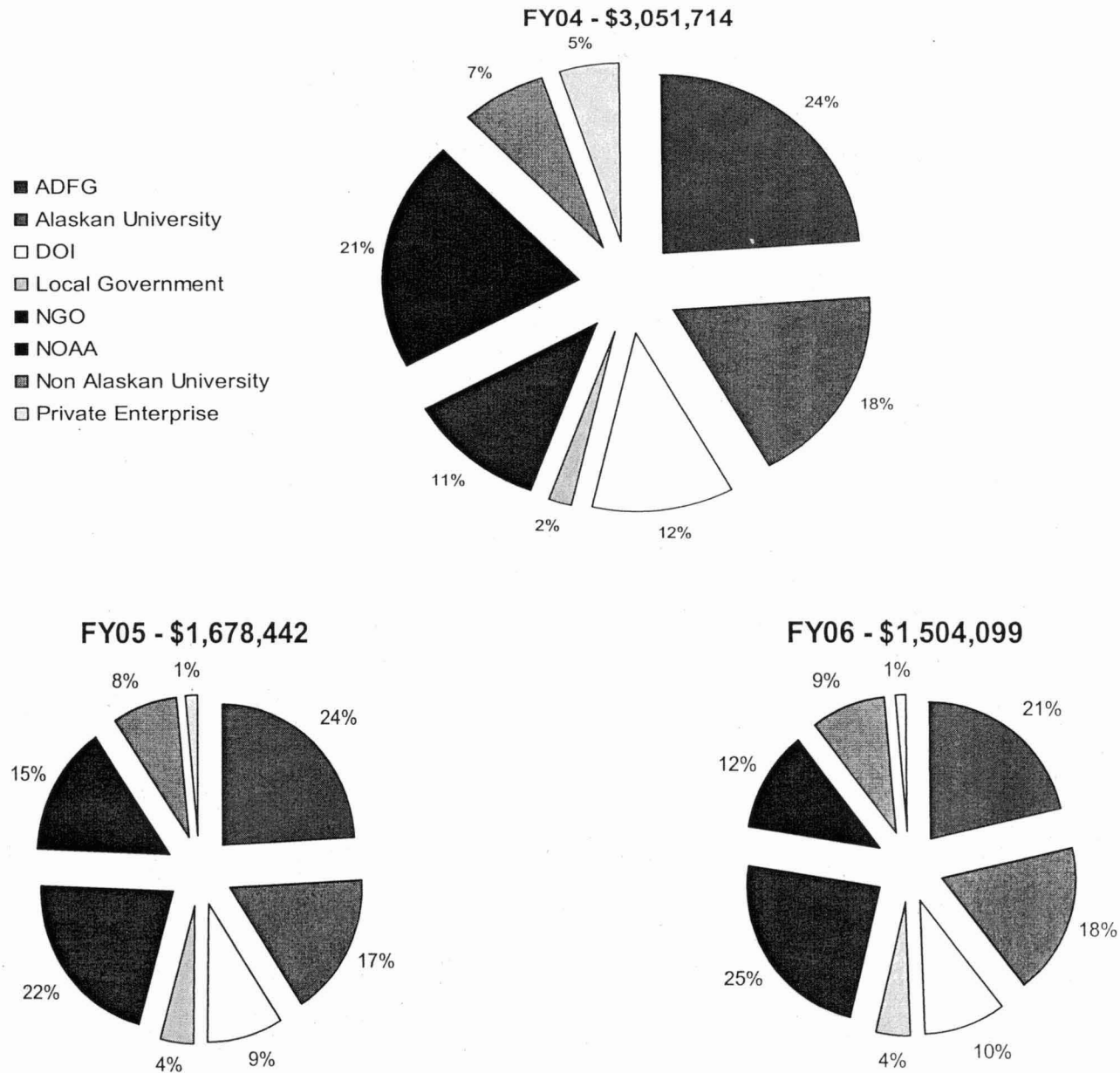
Number of Proposals Received per Invitation Category



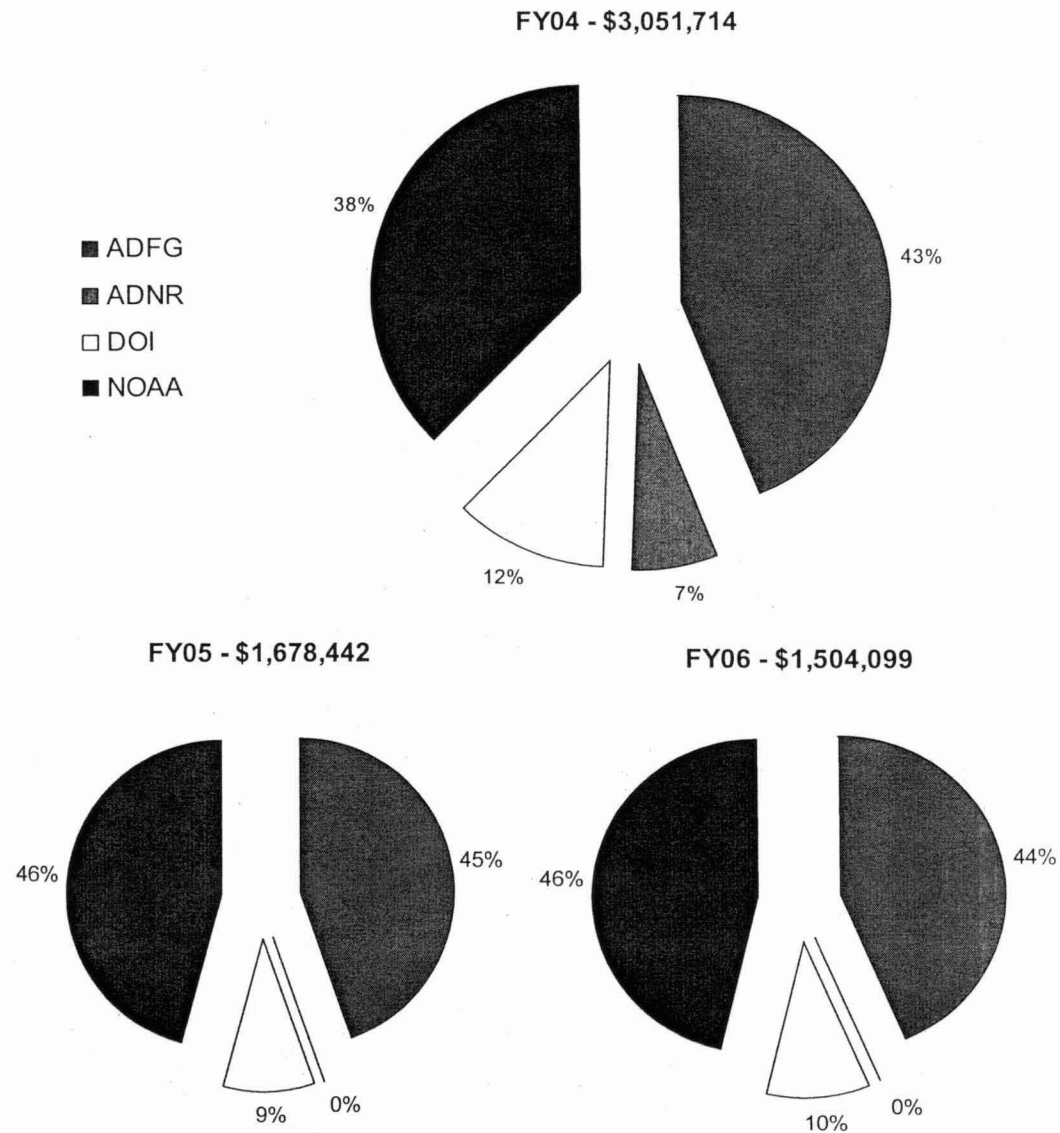
Number of Proposals Recommended For Funding (Fund or Fund Contingent) per Invitation Category



Project Funding Distribution per PI Affiliation per Year



Project Funding Distribution per Agency per Year



ACC Proposals Recommended for Funding and Deferral

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC</i>
Batten-FY04-CPR data	\$135,200	\$135,200	\$135,200	Fund
Bechtol-FY04-Parameters in the N Gulf of AK	\$50,900	\$54,000	\$56,000	Fund
Cokelet-FY04-AK Marine Highway System Ferries	\$171,500	\$185,900	\$145,900	Fund
Okkonen-FY04-Monitoring Program in the NE Pacific Ocean	\$27,289	\$30,366	\$31,455	Fund
Stabeno-FY04-Bottom Control	\$49,500	\$0	\$0	Fund
Weingartner-FY04-Alaska Coastal Current	\$75,482	\$75,482	\$75,482	Fund
Willette-FY04-Monitoring ACC Dynamics	\$89,800	\$68,000	\$27,900	Fund
<u>Fund + Contingent Totals</u>	\$599,671	\$548,948	\$471,937	
Matkin-FY04-Killer Whales in PWS/Kenai Fjords	\$19,502	\$0	\$0	Defer
Vaughan-FY04-Hinchinbrook Entrance	\$81,799	\$0	\$0	Defer
Kline-FY04-Exchange between GOA and PWS	\$142,800	\$189,300	\$193,500	Defer
Bird-FY04-Mobile Data Network- Vessels	\$140,900	\$129,200	\$130,700	Defer
<i>Defer Totals</i>	\$385,000	\$318,500	\$324,200	
<i>Grand Total</i>	\$984,671	\$867,448	\$796,137	

Community Involvement Proposals Recommended for Fund and Defer

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC</i>
Adams-FY04-Fisheries Management	\$46,760	\$0	\$0	Fund
Baird-FY04-Shoreline Habitat Mapping and Community-Based Monitoring	\$20,100	\$19,900	\$0	Fund
Cooper-FY04-Community-Based Sampling	\$102,512	\$85,958	\$96,942	Fund
Schneider-FY04-Kodiak Archipelago	\$63,000	\$63,000	\$63,000	Fund
<u>Fund + Contingent Totals</u>	\$232,372	\$168,858	\$159,942	
DeLorenzo-FY04-Youth Area Watch	\$121,100	\$126,400	\$133,200	Defer
Brown-Schwalenberg-FY04- Subsistence & Stewardship Gathering	\$31,250	\$0	\$0	Defer
<i>Defer Totals</i>	\$152,350	\$126,400	\$133,200	
<i>Grand Total</i>	\$384,722	\$295,258	\$293,142	

Data Management Proposals Recommended for Funding

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC</i>
Kiefer-FY04-Alaskan Groundfish Feeding Ecology	\$80,900	\$0	\$0	Fund
Macklin-FY04-NGOA Metadatabase	\$100,600	\$0	\$0	Fund
Saupe-FY04-Habitat Web Site	\$21,100	\$0	\$0	Fund
<i><u>Fund + Contingent Totals</u></i>	<i>\$202,600</i>	<i>\$0</i>	<i>\$0</i>	
<i>Grand Total</i>	<i>\$202,600</i>	<i>\$0</i>	<i>\$0</i>	

Lingering Oil Proposals Recommended for Funding and Deferral

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC</i>
Fall-FY04-Status of Subsistence Uses	\$298,700	\$25,600	\$0	Fund
Irons-FY04-Bird Abundance in PWS	\$175,518	\$0	\$0	Fund
Nelson-FY04-Hydrocarbon Database	\$22,200	\$22,200	\$22,200	Fund
Rosenberg-FY04-Harlequin Duck Population	\$37,100	\$0	\$0	Fund Contingent
Short-FY04-Monitoring Exxon Valdez Oil & PWS	\$45,900	\$0	\$0	Fund Contingent
<u>Fund + Contingent Totals</u>	\$579,418	\$47,800	\$22,200	
Rice-FY04-Lingering Population Status	\$60,000	\$61,000	\$29,100	Defer
Irvine-FY04-Lingering Oil on Boulder- Armored Beaches	\$71,700	\$17,200	\$0	Defer
Bodkin-FY04-Lingering Oil and Sea Otters	\$134,300	\$26,200	\$6,500	Defer
<i>Defer Totals</i>	\$266,000	\$104,400	\$35,600	
<i>Grand Total</i>	\$845,418	\$152,200	\$57,800	

Modeling Proposals Recommended for Funding

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC</i>
McNutt-FY04-GEM Infrastructure	\$80,835	\$80,713	\$83,271	Fund
Schumacher-FY04-GEM Infrastructure	\$22,067	\$23,645	\$22,067	Fund
<u>Fund + Contingent Totals</u>	\$102,902	\$104,358	\$105,338	
Grand Total	\$102,902	\$104,358	\$105,338	

Nearshore Proposals Recommended for Funding and Deferral

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC</i>
Bishop-FY04-Top-down and Bottom-up Processes	\$149,529	\$164,030	\$151,390	Fund
Bodkin-FY04-Nearshore Monitoring Decision Process	\$10,000	\$0	\$0	Fund
Konar-FY04-Natural Geography in Shore Areas	\$248,729	\$0	\$0	Fund
Ruesink-FY04-Altering the Community Structure	\$81,600	\$0	\$0	Fund
Thorne-FY04-Seafood Waste Discharge	\$72,680	\$111,692	\$108,943	Fund
<i><u>Fund + Contingent Totals</u></i>	<i>\$562,538</i>	<i>\$275,722</i>	<i>\$260,333</i>	
Couvillion-FY04-Coordinated Coastal Mapping	\$98,500	\$0	\$0	Defer Funding
Devens-FY04-PWSRCAC-EVOS long - term program	\$141,700	\$0	\$0	Defer Funding
<i>Defer Totals</i>	<i>\$240,200</i>	<i>\$0</i>	<i>\$0</i>	
<i>Grand Total</i>	<i>\$802,738</i>	<i>\$275,722</i>	<i>\$260,333</i>	

Synthesis Proposals Recommended for Funding and Deferral

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC</i>
Eckert-FY04-Natural Variability in the Nearshore	\$36,300	\$17,500	\$0	Fund
Spies-FY04-EVOS Damage Assessment & Restoration	\$201,700	\$0	\$0	Fund Contingent
<i><u>Fund + Contingent Totals</u></i>	<i>\$238,000</i>	<i>\$17,500</i>	<i>\$0</i>	
Merritt-FY04-GEM Watershed Synthesis	\$58,091	\$39,751	\$0	Defer
Mann-FY04-Reconstructing Sockeye Populations	\$91,500	\$42,500	\$40,000	Defer
<i>Defer Totals</i>	<i>\$149,591</i>	<i>\$82,251</i>	<i>\$40,000</i>	
<i>Grand Total</i>	<i>\$387,591</i>	<i>\$99,751</i>	<i>\$40,000</i>	

Watershed Proposals Recommended for Funding and Deferral

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC</i>
Finney-FY04-Marine-terrestrial Linkages	\$79,197	\$80,154	\$81,117	Fund
Honnold-FY04-Marine-derived Nutrients on Sockeye Salmon	\$83,200	\$82,400	\$86,800	Fund
Knudsen-FY04-Nutrient-Based Resource Management	\$173,216	\$157,002	\$152,632	Fund
Walker-FY04-Marine Derived Nutrients		\$150,200	\$153,400	\$149,700 Fund
Heintz-FY04-Energy Allocation	\$48,400	\$42,300	\$14,100	Fund Contingent
<u>Fund + Contingent Totals</u>		\$534,213	\$515,256	\$484,349
Mazumder-FY04-Marine-Derived Nutrients	\$146,292	\$147,414	\$132,942	Defer
<i>Defer Totals</i>	\$146,292	\$147,414	\$132,942	
<i>Grand Total</i>	\$680,505	\$662,670	\$617,291	

GULF OF ALASKA ECOSYSTEM MONITORING AND RESEARCH PROGRAM

WORKING DRAFT SCIENCE PLAN

Fiscal years 2003-2007

May 1, 2003

Gulf of Alaska Ecosystem Monitoring and Research Program
Exxon Valdez Oil Spill Trustee Council
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Anchorage, AK 99501-2340
907-278-8012
907-276-7178 fax

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Foreword

The GEM Science Plan has been developed through a process involving the Scientific and Technical Advisory Committee (STAC), the Public Advisory Committee and the GEM Habitat Subcommittee along with input from the public and stakeholders. The Science Plan is modeled closely after the GEM Program Document, with particular emphasis on Chapter 2, the Conceptual Foundation, and Chapter 4, Program Implementation. In addition to this document, the National Research Council (NRC) review of the GEM program was also a primary source of guidance for the Science Plan. For the sake of brevity, the Science Plan does not reproduce materials available in either of these documents, although some summaries have been provided for the sake of context. The GEM Program Document, as adopted by the *Exxon Valdez* Oil Spill Trustee Council in July 2002, and the NRC review, originally made available in May 2002, are available on the GEM website, <http://www.oilspill.state.ak.us/gem/index.html>

As explained in the GEM Program Document and advised by the NRC review, the Science Plan is necessarily a living document that will be regularly updated by using all the tools, strategies and management processes available to GEM. The process of building and changing the Science Plan must be deliberate and carefully accomplished, guided by GEM's conceptual foundation and new information. GEM is an unprecedented opportunity to do very long-term monitoring and research on the marine ecosystems of the northern Gulf of Alaska. With that in mind, the GEM Science Plan has been written in the spirit of providing a platform from which GEM can both build long-term data sets and adapt to changing ideas about detecting and understanding changes in the valued marine-related resources of the Gulf of Alaska.

Phillip R. Mundy, Science Director
Gulf of Alaska Ecosystem Monitoring and Research Program
***Exxon Valdez* Oil Spill Trustee Council**
Anchorage, Alaska
May 1, 2003

Summary of GEM FY 03 Projects

Project No	Project Title	Proposer	Cluster
030012	Photographic Monitoring of Resident Killer Whales	C Matkin/North Gulf Oceanic Society	Oil Spill Recovery Monitoring
030052	Tribal Natural Resource Stewardship and Meaningful Tribal Involvement in GEM	P Brown-Schwalenberg/CRRC	GEM Cross-Habitat Linkage Community Involvement
030100	Public Information and Administration	All Trustee Council Agencies	Public Information/Administration
030190	Construction of a Linkage Map for the Pink Salmon Genome	F Allendorf/University Montana	Oil Spill Lingered Injury
030210	Youth Area Watch	R DeLorenzo/Chugach School District	GEM Cross-Habitat Linkage Community Involvement
030250	Project Management	All Trustee Council Agencies	Science Management
030290	Hydrocarbon Database and Interpretation Service	J Short, B Nelson/NOAA	Oil Spill Lingered Injury
030340	Toward Long-Term Oceanographic Monitoring of the Gulf of Alaska Ecosystem	T Weingartner/ UAF	GEM Alaska Coastal Current Habitat
030423	Patterns and Processes of Population Change in Selected Nearshore Vertebrate Predators	J Bodkin, B Ballachey/USGS-BRD, D Esler/Simon Fraser Univ	Oil Spill Ecosystem Recovery & Function
030455	GEM Data System	Trustee Council Office	Data Management & Information Transfer
030462	Effect of Disease on Pacific Herring Population Recovery in Prince William Sound	G Marty/University of California, Davis	Oil Spill Recovery Monitoring
030476	Effects of Oiled Incubation Substrate on Pink Salmon Reproduction	R Heintz/NOAA	Oil Spill Lingered Injury
030550	Alaska Resources Library and Information Services (ARLIS)	All Trustee Council Agencies	Data Management & Information Transfer
030556	High Resolution Mapping of the Intertidal and Shallow Subtidal Shores in Kachemak Bay	C Schoch/Kachemak Bay	GEM Intertidal/Subtidal Habitat
030558	Harbor Seal Recovery Application of New Technologies for Monitoring Health	S Atkinson/UAF	Oil Spill Recovery Monitoring
030561	Evaluating the Feasibility of Developing a Community-Based Forage Fish Sampling Project for GEM	D Roseneau/USFWS	GEM Intertidal/Subtidal & Alaska Coastal Current Habitat
030574	Assessment of Bivalve Recovery on Treated Mixed-Soft Beaches in Prince William Sound	D Lees/Littoral Eco & Environ Services	Oil Spill Recovery Monitoring
030575	Designing a Community Involvement/Community-Based Monitoring Plan for GEM	M Sigman/Center for Alaskan Coastal Studies, et al	GEM Cross-Habitat Linkage Community Involvement
030584	Evaluation of Airborne Remote Sensing Tools for GEM	E Brown/UAF, J Churnside/NOAA	GEM Intertidal/Subtidal

Project No	Project Title	Proposer	Cluster
	Monitoring		Habitat
030585	Lingering Oil Bioavailability and Effects to Prey and Predators	J Rice, J Short/NOAA, J Bodkin, B Ballachey/USGS D Esler/Simon Fraser University	Oil Spill Lingering Injury
030596	Securing Flow Data for a Lower Kenai Peninsula Salmon Stream	J Cooper/Cook Inlet Keeper	GEM Watershed Habitat
030600	Synthesis of the Ecological Findings from the EVOS Damage Assessment and Restoration Programs, 1989-2001	R Spies/AMS	GEM Cross-Habitat Linkage Synthesis
030607	Geographic Information Systems (GIS) Map of Water Quality Monitoring Sites Across the Gulf of Alaska	J Cooper/Cook Inlet Keeper	GEM Cross-Habitat Linkage Synthesis
030610	Kodiak Archipelago Youth Area Watch	T Schneider/Kodiak Island Borough School District	GEM Cross-Habitat Linkage Community Involvement
030614	Monitoring Program for Near-Surface Temperature, Salinity, and Fluorescence in the Northern Pacific Ocean	S Okkonen/UAF	GEM Offshore Habitat
030620	Lingering Oil and Predators Pathways of Exposure and Population Status	S Rice, J Short, M Lindeberg/NOAA, J Bodkin, B Ballachey/USGS-DOI	Oil Spill Lingering Injury
030623	PWSRCAC-EVOS Long-Term Environmental Monitoring Program	J Devens/PWSRCAC	GEM Intertidal/Subtidal Habitat
030624	A CPR-Based Survey to Monitor the Gulf of Alaska and Detect Ecosystem Change	S Batten/SAHFOS D Welch/DFOC	GEM Offshore & Alaska Coastal Current Habitat
030625	Prince William Sound Isotope Ecology Synthesis	T Kline/PWSSC	GEM Cross-Habitat Linkage Synthesis
030630	Scientific Management under GEM	Trustee Council Office	Science Management
030636	Management Applications Commercial Fishing	K Adams, R Mullins/Cordova	GEM Cross-Habitat Linkage Community Involvement
030641	ShoreZone Mapping for GEM	J Harper/COR Inc	GEM Intertidal/Subtidal Habitat
030642	Database on the Marine Invertebrate Macrofauna of Prince William Sound An Addition to the University of Alaska Museum's ARCTOS Network	N Foster/UAF Museum	GEM Intertidal/Subtidal Habitat
030647	Investigating the Relative Roles of Natural and Shoreline Harvest in Altering the Kenai Peninsula's Rocky Intertidal	J Ruesink/UAF	GEM Intertidal/Subtidal Habitat

Project No	Project Title	Proposer	Cluster
030649	Reconstructing Sockeye Populations in the Gulf of Alaska over the Last Several Thousand Years	B Finney/UAF	GEM Watershed Habitat
030654	Surface Nutrients over the Shelf and Basin in Summer Bottom-up Control of Ecosystem Diversity	P Stabeno/NOAA-PMEL C Mordy/NOAA-PMEL	GEM Alaska Coastal Current Habitat
030656	Retrospective Analysis of Nearshore Marine Communities Based on Analysis of Archaeological Material and Isotopes	G Irvine/USGS, J Schaaf/NPS, D Mann/UAF J Southon/University California	GEM Intertidal/Subtidal Habitat
030666	Alaska Natural Geography in Shore Areas An Initial Field Project for the Census of Marine Life	B Konar/SFOS-UAF K Iken/SFOS-UAF	GEM Intertidal/Subtidal Habitat
030684	Toward Sustainable Management in the Kenai River Watershed Linking Human & Resource Development with Nutrient & Energy Pathways	A Mazumder/University Victoria J Edmundson/ADF&G W Hauser/ADF&G	GEM Watershed Habitat
030685	Visible Remote Sensing of the Gulf of Alaska	S Pegau/Kachemak Bay Research Reserve	GEM Offshore Habitat
030687	Monitoring in the Nearshore A Process for Making Reasoned Decisions	J Bodkin/DOI-USGS T Dean/CRA, Inc	GEM Intertidal/Subtidal Habitat

Summary of GEM FY 04 Actions by Projects and Staff

The following list summarizes the major actions in each habitat type and identifies the ways in which they are to be accomplished by project selected in response to the FY 04 Invitation (project) or by staff (staff) Please see the main document for detailed explanations of rationales and out-year schedules

Alaska Coastal Current

- Maintain support for the Seward GAK1 time series (project), PWS monitoring (project), continuous plankton recorder (project), and thermosalinograph and fluorometer (project) on vessels of opportunity Investigate possibilities for real time data extraction (staff)
- Evaluate options for partnering with the Alaska Marine Highway System for thermosalinograph, fluorometer, and eventually nutrient monitoring on ferry routes throughout the northern GOA (project)
- Continue to monitor nitrate over the shelf and basin as part of the NMFS-OCC/GLOBEC salmon survey in July/August 2004 (project)
- Continue development of interdisciplinary fisheries oceanography measurement project at Anchor Point in Cook Inlet to understand dynamics of Alaska Coastal Current in relation to management of sockeye salmon fishery (project)
- Develop a web based system for distributing information and peer reviewed, author-attributed data sets from the GEM program (project)

- Establish web pages for each habitat and the GEM Model (Cross Habitat activities) on the EVOS web site, which would contain relevant EVOS publications, reports, data sets, and other information (staff)
- Provide links to web sites displaying graphical information with data from current projects, including Seward Line Station 1 (GAK1), Continuous Plankton Recorder, thermosalinograph and fluorometer (staff)
- Initiate GEM biophysical model development (project)
- Continue process of establishing operational fisheries oceanography programs in Cook Inlet (staff) Develop relationships with fishery managers in Cook Inlet in preparation for long-term development of fishery management tools, and to coordinate GEM ecosystem model development with fishery management needs (staff)
- Analyze information needed to support resource and environmental management decisions for human activities in the ACC (project)

Nearshore

- Establish web pages for each habitat and the GEM Model (Cross Habitat activities) on the EVOS web site which would contain relevant EVOS publications, reports, data sets, and other information (staff)
- Coordinate and facilitate interaction among investigators in nearshore projects to plan for FY 05 Invitation for Proposals (projects and staff)
- Analyze information needed support resource and environmental management decisions for human activities in the nearshore (project)

Watersheds

- Complete work and analyze cores of sediments from sockeye-bearing lakes on the Kenai Peninsula and Prince William Sound to understand the natural variability of production in these systems in the distant past (up to 5,000y) (project)
- Identify and demonstrate statistically rigorous sampling strategies including use of existing water quality sampling programs that monitor human activities for detecting marine signals and proxies from plants and animals in the marine watersheds and nearby nearshore areas (project)
- Identify and demonstrate cost effective community based sampling strategies for citizen monitoring of marine-related variables and proxies in watersheds and nearby nearshore areas Demonstrate how to incorporate proven approaches to community based monitoring of the aquatic environment, including QA/QC of citizen monitoring data (project)
- Establish web pages for the Watershed habitat and the GEM Model (Cross Habitat activities) on the EVOS web site which would contain relevant EVOS publications and reports and other information (staff)
- Investigate opportunities to improve and/or extend the quality and availability of existing community based data collection projects for key physical, chemical, and biological variables in coastal watersheds of the GEM region (staff)
- Participate with regional partners in developing a strategic plan to use and improve remote sensing data acquisition, analysis, and modeling of coastal watersheds of the GEM region (staff)

Offshore

- Actions in the offshore are combined with those of the ACC for FY 04

Guide for Readers

The GEM Science Plan is a working document for the reference of those who work with the GEM Program on a regular basis, or who may have an interest in reviewing the actions underway or planned for program implementation. As a working document for a new program, some of the sections are currently placeholders for materials to be developed over time and may have very little content at present. Readers who are familiar with the GEM Program may skip directly to the section entitled "GEM Science Plan," while those who are new to the program should start with the Background Materials.

Background materials highlighting key features of the GEM Program Document are included here as a convenience. For more complete information the reader should see the full document at <http://www.oilspill.state.ak.us/gem/documents.html>

Background Materials

Mission and Goals

The mission of the Gulf of Alaska Ecosystem Monitoring and Research (GEM) Program, as adopted by the Exxon Valdez Oil Spill Trustee Council in July 2002, is to

Sustain a healthy and biologically diverse marine ecosystem in the northern Gulf of Alaska and the human use of the marine resources in that ecosystem through greater understanding of how its productivity is influenced by natural changes and human activities

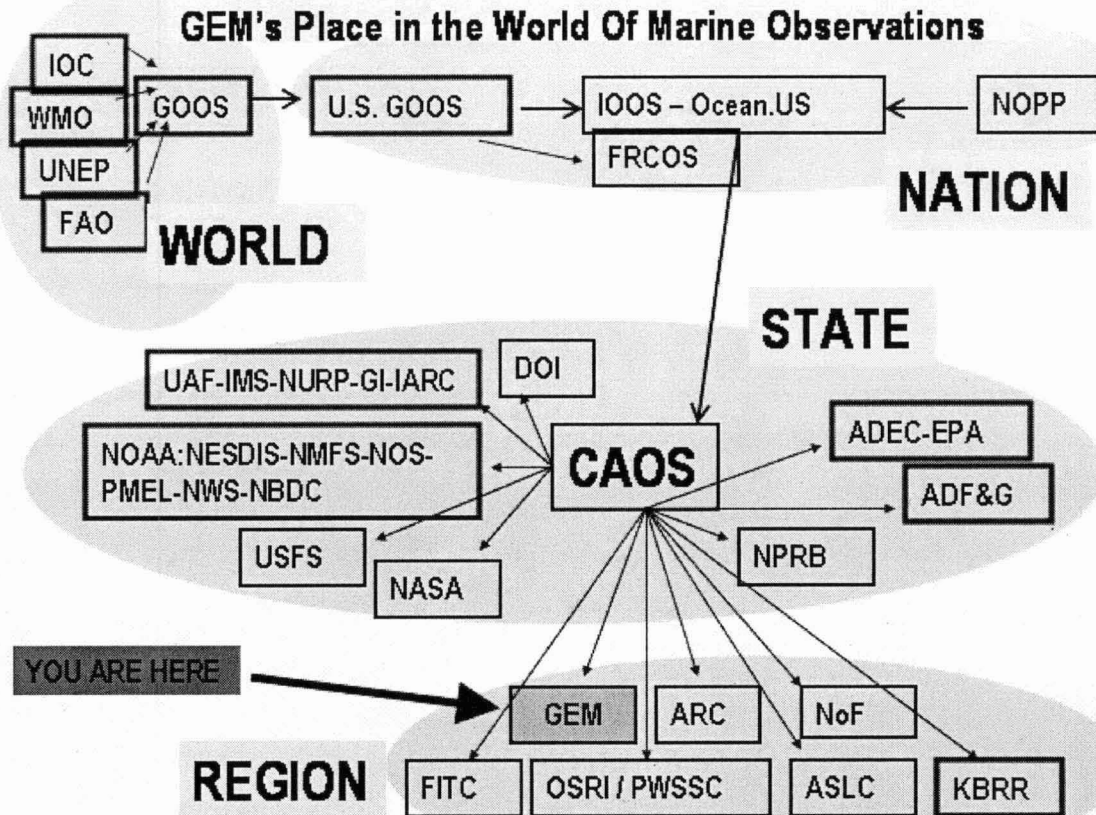
The goals of the GEM Program are to

- 1 **Detect** Serve as a sentinel (early warning) system by detecting annual and long-term changes in the marine ecosystem, from coastal watersheds to the central gulf
- 2 **Understand** Identify causes of change in the marine ecosystem, including natural variation, human influences, and their interaction
- 3 **Inform** Provide integrated and synthesized information to the public, resource managers, industry, and policy makers in order for them to respond to changes in natural resources
- 4 **Solve** Develop tools, technologies and information that can help resource managers and regulators improve management of marine resources and address problems that may arise from human activities
- 5 **Predict** Develop the capacity to predict the status and trends of natural resources for use by resource managers and consumers

Global Context

As an emerging regional marine science program, GEM must ensure that its actions are compatible and complementary to national and global programs that serve the same purposes. Indeed, given the large spatial scales over which biological and physical phenomena operate, it would be impossible to understand and predict changes in the region's natural resources without the cooperation and support of partners with broader geographic mandates. The large spatial scales require ecosystem-based natural resource management to have a global perspective. Developing a global context requires developing the understanding of how phenomena at distant localities affect local conditions and biology. For example, warming of the Pacific Ocean at the equator early in the calendar year may lead to weather changes in the Gulf of Alaska in the fall and winter of the same calendar year and change the abundance of salmon five calendar years later. Establishing the global context requires linking events at widely divergent times and places to explain events in the here and now.

As an integral component of the now-developing Coastal Alaska Observing System (CAOS) and the U.S. Integrated and Sustained Ocean Observing System (IOOS), GEM is one building block in a global observing system currently under construction (figure on following page). Efforts are underway all across the world to make a global ocean observing system (GOOS) a functional analog to the system now in place for meteorology. Due to the efforts of global organizations (e.g., World Meteorological Organization), advances in computer processing speed, the growth of satellite observing systems, and the growing political awareness of the local consequences of global change, it is now realistic to envision GEM as a significant component of this global observing system. Linking biological and physical observations over thousands of miles through models to understand changes in single species is a daunting task, but one that is becoming increasingly possible.



As part of a larger ocean observing system, the challenge of the GEM Science Plan is to bring the terminology needed in ocean observing into common use by the public. The meteorological community has made household words out of terms such as barometric pressure, relative humidity, wind direction and magnitude, air temperature and precipitation. While the public does not know how models forecasting weather work, the public is comfortable with the terminology and uses some of the information in daily planning. Words such as sea surface temperature, salinity, sea level pressure, fluorescence, nitrates, and silicates are not household words now. However, these are the variables that are critical to creating the physical and biological models important in detecting and understanding change over time. An equally important parallel role will be for GEM to assist the public in understanding how these measurements can be used to understand and manage ecosystems.

GEM Conceptual Foundation

The GEM conceptual foundation is the backbone of the Science Plan. It is the broadest of a cascading series of increasingly specific ideas about how marine-related ecosystems function that form the intellectual framework of the GEM Program. This framework is composed of a conceptual foundation, central hypothesis, habitat-specific hypotheses, research questions, and ultimately, testable hypotheses based on the specific questions. The conceptual foundation provides a verbal model of how the Gulf of Alaska (GOA) ecosystems produce biological

resources. As such, the conceptual foundation is not a testable hypothesis, but rather, the origin of hypotheses and the Science Plan.

In summary, the GEM conceptual foundation describes how

The Gulf of Alaska and its watersheds are part of a larger oceanic ecosystem in which natural physical forces such as currents, upwelling, downwelling, precipitation, and runoff, acting over large and small distances, play important roles in determining basic biological productivity. Natural physical forces respond primarily to seasonal shifts in the weather, and in particular to long-term changes in the intensity and location of the Aleutian Low in winter. Increased upwelling offshore appears to increase inputs of nutrients to surface waters, which increases productivity of plankton. Increased winds appear to increase the advective transport of zooplankton shoreward toward and past the shelf-break. How often and how much offshore zooplankton sources contribute to coastal food webs depends on natural physical and biological forces such as predation, migration, currents and structure of the fronts, formation and stability of eddies, degree and extent of turbulence, and responses of plankton to short and long-term changes in temperature and salinity.

GEM Central Hypothesis

Identifying the forcing factors, human and natural, that drive biological production requires framing hypotheses and questions that point the way for a monitoring and research program. The central hypothesis formally states widely held beliefs about what drives change in living marine-related resources in time and space.

Natural forces and human activities working over global to local scales bring about short term and long lasting changes in the biological communities that support birds, fish, shellfish, and mammals. Natural forces and human activities bring about change by altering relationships among defining characteristics of habitats and ecosystems such as heat and salt distribution, insolation, biological energy flow, freshwater flow, biogeochemical cycles, food web structure, fishery impacts, and pollutant levels.

Habitat Types

To better organize the GEM Program, four habitat types, representative of the GEM region, have been identified as themes around which the interdisciplinary monitoring and research activities that address GEM's central hypothesis will be organized. The habitats are composed of identifiable, although not rigid, collections of characteristic microhabitats, resident and migratory species, and physical features. Cross-habitat processes and transfers must be included and addressed. The habitats are

- Alaska Coastal Current – a swift coastal current of lower salinities (25 to 31 psu) typically found within 35 km of the shore
- Nearshore (Intertidal and Subtidal) areas – brackish and salt-water coastal habitats that extend offshore to the 20-m depth contour
- Watersheds – freshwater and terrestrial habitats from the mountains to the extent of a river's plume

- Offshore – the continental shelf break (between the 200-m and 1,000-m depth contours) and the Alaska Gyre in waters outside the 1,000-m depth contour

The GEM program will sustain monitoring and database accumulation (including relevant metadata and data from partner agencies) of habitat and biotic community variables in these four habitat types. Each of these habitats has distinctive environmental processes and biota. Each requires different expertise and equipment for gathering scientifically credible data, although GEM's community involvement strategy recognizes that not all such data need be gathered by persons who are formally educated ecological professionals.

Community Involvement

Community involvement is one of two key implementation strategies for GEM. Since its inception, the *Exxon Valdez* Oil Spill Trustee Council has been committed to public participation and local community involvement in all aspects of the restoration program. The Trustee Council recognizes the tremendous loss of livelihood and cultural heritage caused by the 1989 oil spill and has devoted a major portion of the restoration funds to the restoration of natural and archaeological resources that are important culturally and economically. This effort has included significant public and community involvement and outreach. As the Gulf of Alaska Ecosystem Monitoring and Research (GEM) program develops, the Trustee Council will continue to rely on community involvement, use of local and traditional knowledge, public participation, education, and outreach. These will be major components of the Trustee Council's long-term effort to restore and better understand the northern Gulf ecosystem.

Sustaining a healthy ecosystem depends ultimately on the ability and will to influence human activities in order to avoid negative impacts to the ecosystem and its resources. The ability to do so is constrained both by the limits of knowledge and understanding and by the extent to which human activities can be managed. The latter is dependent largely on the willingness of those who use the ecosystem and its resources to help develop, support, and cooperate in management and stewardship actions. The degree to which the region's communities and affected organizations are involved in GEM will be a major factor in establishing the sense of cooperation and shared mission that will determine the eventual success of GEM as a whole.

Community involvement spans a broad spectrum, from receiving information in useful and comprehensible formats, to helping set program goals and objectives, to participating in and conducting research and monitoring projects. For community involvement to succeed, GEM will need to provide certain infrastructure and other support. Data management practices will need to accommodate community-generated data and provide access for community members. Research and monitoring conducted in or near communities or harvest areas will require structured interactions among scientists and community members and stakeholders to stimulate ideas, to analyze and interpret results, and to reach a common understanding about how these efforts contribute to GEM's overall research and monitoring efforts. The data and results from GEM will need to be interpreted and disseminated in comprehensible form to communities, organizations, and the general public to explain what GEM has accomplished and to promote the application of its findings by those who use or influence the Gulf ecosystem.

Community involvement is thus an integral part of GEM as well as a distinct activity requiring dedicated attention and resources. The effectiveness of individual community involvement

activities will be evaluated on a regular basis, as will the community involvement component as a whole. This process will allow the continued refinement, adaptation, and improvement of the community involvement effort.

Management Applications and Products

As an implementation strategy, GEM data and information are to be gathered with a view toward their eventual application in natural resource management activities. Over time GEM will become a source of the kinds of information that resource managers can use to advise resource dependent communities of the possibilities of changes in their livelihoods, as well as to minimize the adverse effects of human activities on biological production. In so doing GEM will add value to the natural resources for coastal communities by helping conservation efforts and by enhancing abilities to anticipate changes in natural resources. The long-term record produced by GEM will be a premier tool in providing these management products.

Assumptions and Approaches

Key assumptions and approaches from the GEM Program document that figure prominently in the science plan are listed here:

- Long-term data sets of physical and biological observations are essential to detect and understand ecosystem change over time. Observations are essential to understand how ocean currents move food and energy into the trophic webs of seabirds, marine mammals and fish. Platforms for the observations include moorings, vessel transects and surveys that are relevant to specific aspects of the marine ecosystems of the northern Gulf of Alaska.
- The long-time series data produced must provide information on the status and future of productivity in the northern Gulf of Alaska marine ecosystem and be relevant to the interests of those concerned with balancing the management for human uses of its natural resources with natural variability; however, it is recognized that such data schemes and information derived from them will not be immediately available.
- The information is to be collected over the long-term in geographic areas not routinely addressed by other information gathering activities of state, federal and intersecting interests. The variables are to be those most common to methods of determining the status and future of marine ecosystems.
- The initial approach to the Science Plan is to place a priority on detection of change. Implementation will be guided by the sequence of the goals of the program: to first, attain the ability to detect changes in the environment, then to understand the origin of those changes, to inform about changes and their origins, to use the information to solve problems created by changes, and lastly to predict changes.
- Achieving the overall mission of GEM ("Sustain a healthy and biologically diverse ecosystem in the northern Gulf of Alaska and the human use of marine resources in that ecosystem") requires applying the understanding generated by GEM projects to management and stewardship of the region's resources. This in turn requires long-term involvement by communities, tribes, stakeholders, and affected organizations in the region. As such, community involvement will be strongly encouraged and facilitated throughout the development and implementation of the GEM Science Plan.

- The Science Plan will be developed iteratively, beginning as stated above with the near-term goal of identifying geographical sampling sites and physical and biological variables for monitoring. Monitoring will be phased in as soon as practicable, but always with active scientific involvement in evaluation of both the data and the ecosystems from which it is drawn. For example, even a one-year time series of data can characterize basic seasonality for any given site, a three-year series will start to characterize interannual variability, and a few decades of data will start to show the longer periods in the spectrum of environmental change.
- Selection of sites and variables will require completion of tasks in a progression: synthesis of environmental information already available, including analysis of gaps in information and theory, initial identification of sites and variables, process and statistical modeling with particular emphasis on the sampling requirements and unit costs for producing useful long-term time series, and identification of partnerships that will extend the sampling range and data production capability of GEM.
- Initial efforts need to be largely focused on development of long-term monitoring activities (i.e., moorings, stations, transects, surveys) in the habitat types of the nearshore (intertidal and subtidal) and Alaska Coastal Current, as determined by the gap analysis, conceptual foundation, and fiscal constraints. Developments in the watersheds and offshore areas need to follow further developments of the conceptual foundation and efforts of other parties in the watersheds and offshore, as also indicated by the gap analysis and fiscal constraints.

Bibliography of Key References on Background Materials

Gem Program Document adopted July 2002

<http://www.oilspill.state.ak.us/gem/documents.html>

NRC 2002. A Century of Ecosystem Science: Planning Long-Term Research in the Gulf of Alaska. Committee to Review the Gulf of Alaska Ecosystem Monitoring Program, National Research Council. National Academies Press, Washington, D.C.

<http://www.oilspill.state.ak.us/gem/documents.html>

GEM Science Plan

Introduction

The Science Plan is a working reference document that includes the information on locations, objectives and rationales for GEM projects in the context of current information and activities in the region. The Science Plan contains the following information:

- Geographic scope and scale within which data acquisition occurs,
- Latest relevant scientific information on habitat types and the processes that connect them,
- Hypotheses across and within habitat types that organize the information into coherent explanations of what controls change in the region's populations of birds, shellfish and mammals,
- Gaps in knowledge of population control mechanisms that need to be filled in order to detect, understand and predict changes in the region's animal populations,
- Summaries and details of the existing data collection programs and how GEM efforts are designed to complement them,
- GEM work in progress,
- GEM work that needs to be done as soon as possible,
- Current expectations for work in the future, and
- Current and prospective status of the two GEM implementation strategies: community involvement and management applications and products

Overview

As a brief overview, the largest information gaps in the northern Gulf of Alaska relate to how food and energy originating in the offshore marine environments are transported through the Alaska Coastal Current and nearshore areas to the watersheds. Accordingly, detecting changes in the variables that characterize the transfer of food and energy through the northern Gulf of Alaska is a top priority for the GEM Program. The GEM Program calls for building upward from oceanography through food and energy toward the large body of information that has accumulated within the management agencies over the past century on the abundance and biology of single species of large vertebrates such as seabirds, pelagic and anadromous fish, and marine and coastal mammals. In watershed and nearshore habitats where human activities are most prominent, it is important to find measures of how anthropogenic factors combine with human factors to influence these ecosystems. By filling gaps in how physical and human forces alter the transport of food and energy, changes in the large vertebrate species and prominent invertebrates, such as birds, shellfish, fish and mammals, can be understood in relation to a broad array of biological and physical observations throughout the region. In the long run, this comprehensive understanding of the ecosystems of the Gulf of Alaska is intended to lead to predictions of use to resource managers. In terms of types of long time series in these habitat types, observations on smaller to microscopic species of marine plants and animals, and physical and chemical observations from below the sea surface are widely lacking (GEM Program Document, Appendix D).

Initial efforts will focus on development of long-term moorings, stations, transects, and surveys in the nearshore and Alaska Coastal Current habitats, recognizing that the most expensive sampling zones to reach on a frequently recurring basis are the ACC and, at some point in the future, the offshore Gulf of Alaska. The limits on GEM fiscal resources likely will require maximum use of volunteer observing ships (VOS), which are commercial vessels that carry various monitoring instruments. Preparing for instrumentation of VOS and establishing the necessary relationships with ship operators and crews should be a priority early in the program.

In addition, a whole ecosystem (natural resource) model, as recommended by the National Research Council (NRC 2002) would link biological and physical observations across the habitat types, as well as the North Pacific, in order to understand changes in single species of interest to managers and concerned others. The GEM ecosystem model must be developed with a global perspective given the large spatial scales over which biological and physical phenomena operate.

Identification and prioritization of the variables for the GEM program depend in large part on what is needed to operate the GEM ecosystem model. High priority variables needed in the GEM program are a composite of the variables essential to the workings of the GEM ecosystem model and its components: the ocean current model, the nutrient-phytoplankton-zooplankton (NPZ) models, and the Sound Ecosystem Assessment (SEA) pink salmon model (Willette et al 2001, Patrick et al 2003) (see Appendix F of the GEM Program Document). In assembling the GEM ecosystem model, emphasis will be placed on detecting changes in the variables that characterize the currents and the transfer of food and energy throughout the north Gulf of Alaska. In this way, changes in the large vertebrate species that are routinely monitored by state and federal government agencies can be better understood in relation to a broad array of biological and physical observations throughout the region.

Geographic Scope and Scale

The end point for monitoring is a geographically distributed network that produces long-term observations on the state of the marine ecosystem in the GEM region, using basic spatially structured survey methods. At some point in the future the data stream from the geographically distributed network of sampling activities is expected to enable adaptive approaches to data acquisition, such as using GEM's coupled biophysical model in data assimilation mode. The GEM biophysical model outlined below is an important part of the program that provides linkages across habitat types. The geographically distributed approach sets a broad spatial scale for monitoring within the spill affected area and adjacent waters, using a combination of GEM activities with those of other entities. The trajectory of the 1989 oil spill provides a map for organizing the initial sampling program.

GEM projects are expected to be organized around an environmental axis defined by the surface trajectory of the oil spilled in 1989 (figure ACC-1). This trajectory also defines the advective transfers of many marine ecological components in the northern Gulf of Alaska, and is coincident with the path of the Alaska Coastal Current (ACC) in the oil spill affected areas. Areas where the oil came ashore emphasize the intersection between the ACC and the nearshore habitat types. The region of interest begins in Prince William Sound (PWS), including its watersheds and adjacent intertidal and subtidal areas. The region extends throughout the sound, then emerges with the flow into the region of the buoyancy driven Alaska Coastal Current (ACC). The ACC branches just southwest of PWS, with one limb flowing along the eastern

shore of Kodiak Island, while the other limb turns toward Cook Inlet, Shelikof Strait and the Aleutian Peninsula (figure ACC-2). Because the ACC interacts with the offshore Alaskan Stream, a major North Pacific boundary current, the region of interest extends seaward and out into the main subarctic water mass of the Gulf of Alaska.

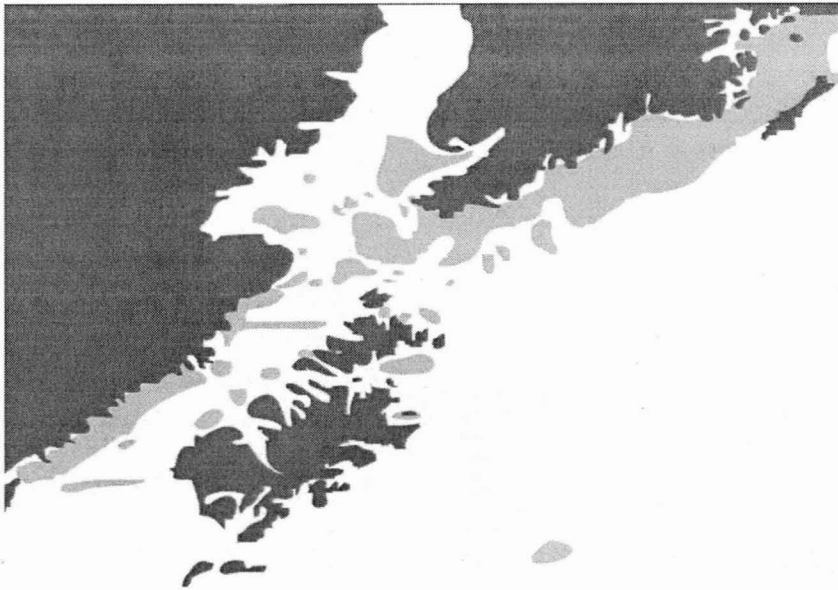


Figure ACC-1. The path of the 1989 oil spill. Driven by wind and currents, the pathway of the oil from the *Exxon Valdez* highlighted the importance of advective transfers of momentum, energy, nutrients and food in the northern Gulf of Alaska.

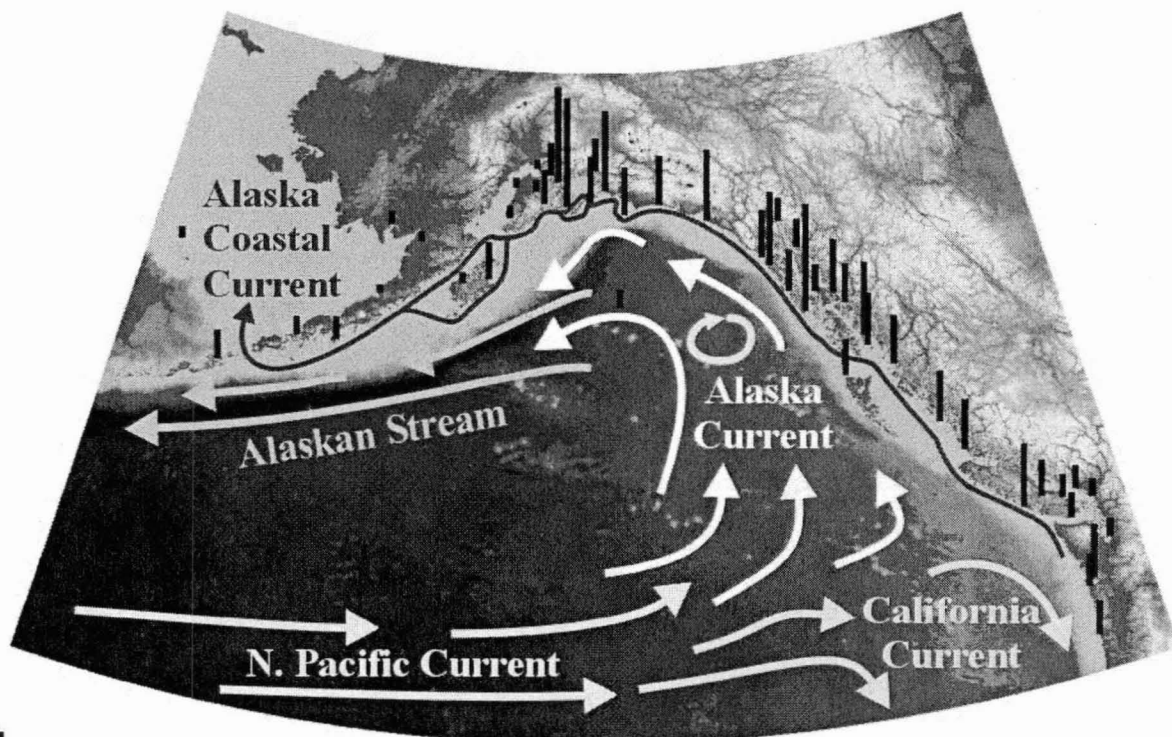


Figure ACC-2. Schematic surface circulation fields in the Gulf of Alaska and mean annual precipitation totals from coastal stations (black vertical bars) and for the central gulf. Figure courtesy of Weingartner and Danielson after Baumgartner and Reichel (1975).

The GEM Model Cross Habitat Synthesis

The GEM program will organize its thinking using a model (GEM Program Document, Chapter 8, Appendix F) of physical and biological processes in the region. The physical and biological processes of the biogeochemical cycle unite the GEM habitat types. The influences of climate and oceanography change the rates of transfer of food and nutrients, which are parts of the biogeochemical cycle, to alter the structure of the food webs in the northern Gulf of Alaska. As identified in the conceptual foundation, the offshore habitat type - and particularly the central Gulf of Alaska - is the origin of nutrients and carbon that are destined for the nearshore and watersheds via the Alaska Coastal Current. Some of the nutrients and carbon will be returned from the watersheds to return to the offshore again via the nearshore and ACC. Throughout this biogeochemical cycle, the transport of nutrients and carbon both drive and determine the structure of food webs, stimulating primary and higher order production within all the habitat types.

Transport mechanisms that are critical to originating and supporting biological production may be used to characterize the habitat types. The offshore is the upwelling-downwelling domain, the ACC and watershed are advective domains, and the nearshore is a combined upwelling-downwelling and advective domain. The nearshore and Alaska Coastal Current habitats are central connections between the watersheds and offshore. Models created in response to short term needs such as the SEA pink salmon model do not necessarily require that the "big picture" be completely defined before they can be implemented. Issues of time and space scales will need to be addressed when local solutions are coupled to other models. In fact, knowledge of how the smaller pieces work is needed in order to make the connections to the big picture models. Among the "smaller short term solutions" are the SEA models of phytoplankton and zooplankton production and juvenile pink salmon survival (Percy 2001, Eslinger et al 2001, Patrick et al 2003).

A number of important biological and physical models directly applicable to Prince William Sound have recently been published (see GEM Program Document, Chapter 8 and Percy 2001), and are available as starting points for the GEM model. Interdisciplinary models of the control of year class strength in herring and pink salmon have been developed and tested against a substantial body of field data (Cooney et al 2001a). In the process of examining the survival mechanisms for herring and pink salmon, the models touched on physical mechanisms that control the distribution of nutrients and food, and how the distributions of nutrients and food determine trophic relationships that involve many other species. SEA's mathematical model of early marine survival of pink salmon was used to test and validate the production control mechanisms of prey switching by predators, salmon foraging behavior, and salmon size and growth as tested against field as mechanisms determining year class strength (Willette et al 2001).

An important discovery of the modeling work of Willette et al (2001) and other interdisciplinary SEA modeling efforts that is important to building the GEM model is the lack of independence in the classic concepts of "top down" and "bottom up" control of biological production. The concepts are so interdependent that they cannot be studied separately to any purpose that would prove meaningful in natural resource management. Studying physics and chemistry (bottom up) or a single species in relation to its predator and food species (top down) in isolation from one another cannot unravel the mysteries of control mechanisms for biological production. A sound

theoretical basis for the control of biological production, as articulated in explicit biophysical models that permit testing hypotheses, is absolutely essential to understand mechanisms of control of biological production (Cooney et al 2001b, Willette et al 2001, Eslinger et al 2001, Wang et al 2001) The primary challenge in producing the GEM model is to develop the interdisciplinary working team necessary to articulate a truly comprehensive biophysical model of biological production (Wooster 1987)

GEM Cross Habitat Working Concepts

GEM's central hypothesis (GEM Program Document, Chapter 2 2) was designed to be broad enough to contain subordinate hypotheses consistent with the latest scientific knowledge A less elaborate version of the central hypothesis, the Cross Habitat Working Concept, serves as the basic scientific guide for the GEM program The current GEM *Cross Habitat working concept* is

Changes in advective and upwelling processes, brought about by periodic and aperiodic changes in climate, and by periodic changes in the input of energy, control production of animals and structures food webs across all the habitat types on decadal scales in the northern Gulf of Alaska by limiting the amounts, distribution mechanisms and pathways for nutrients and food

Changes in biological production on large time and space scales are brought about primarily by changes in energy passing through the system, but the mechanisms for change are not known Human influences, such as fishing, aquaculture activities and pollution tend to function on smaller scales although a (i e , global warming happens at a larger scale), and to be more dominant in the watersheds and nearshore habitat types, but not exclusively (GEM Program Document, Chapters 2, 6 and 7) Variations in the input of solar energy play an important role on annual and very long term (100Ky) variability in biological production, and forcing from lunar gravity appears related to changes in biological production with time periods of about twenty years (18 6y lunar tidal cycle) (Parker et al 1995, GEM Program Document, Chapter 7)

On the spatial scale of the northern Gulf of Alaska and on decadal time scales, GEM's working concept is regarded by the scientific community as a self-evident truism, although much remains to be learned about the details For smaller time and space scales the validity of the working concept is unknown Nonetheless, human interests, and especially those of natural resource managers, are most certainly focused on the smaller time and space scales Hence the role of GEM is to test the working concept as thoroughly as budgets permit on shorter time and space scales, while helping regional efforts work out the details of how the "big picture" working concept actually functions For example, it may be possible to identify localities in which mechanisms of biological production function in isolation from external forcing for time periods long enough to set year class strength in a fishery, or to determine the fate of an endangered species In the long-term such localities are not likely to be isolated from external forcing, nor are they likely to be insensitive to initial or boundary conditions provided by physical and biological processes in adjacent habitats

In cases where less than decadal scale variability is of interest, an alternative working concept must be brought into play In the upper trophic levels species with higher mobility can overcome the effects of boundary conditions and external forcing by simply moving to other areas Indeed

this is the value of migration as an evolutionary strategy. The relocation processes, as measured by short term abundance of mobile large species, could mask the forcing, boundary and initial conditions provided by the transfers of energy, momentum and nutrients from other localities and forcing from processes associated with solar and lunar energy inputs. Tractable subsystems, such as those identified by the SEA pink salmon model (Willette et al 2001, Patrick et al 2003), need to be studied and understood in order to learn how well the GEM Cross Habitat working concept may apply on smaller scales.

Whatever the validity of the cross habitat working concept may be, it is clear that the ACC is a key habitat type for studying the cross habitat connections in the GEM region. Distribution mechanisms and pathways are thought to link the offshore to the nearshore and watersheds through the Alaska Coastal Current (GEM Program Document, Chapter 7.6.3). For example, the ACC potentially is important to the circulation dynamics of PWS, clearly, it is a critical advective and migratory path for material and organisms between the GOA and PWS, and it is likely to play similar pivotal roles in energy and nutrient transfer from the central GOA to lower Cook Inlet, Shelikof Strait and eastern Kodiak.

GEM Cross Habitat Projects

GEM cross habitat projects gather data that are expected to be used in the design and location of long-term monitoring projects. In some cases these data have already been used in studies that have detected long-term changes in the climate and biological production of the GEM region. Descriptions of these projects may be repeated in other sections of the Science Plan, since they also figure prominently in the data gathering in each of the habitat types in which they operate. The actions in FY 03 are summarized below, for proposed actions in FY 04 and beyond see the individual habitat sections.

Actions in FY 03

- 030614 - A feasibility study of monitoring near-surface temperature, salinity, and fluorescence fields in the Northeast Pacific Ocean – S. Okkonen. The objective for this proposed research is to use a thermosalinograph and fluorometer to be installed on a crude oil tanker, and to acquire continuous, long-term measurements of the near-surface temperature, salinity, and fluorescence fields along the tanker route between Valdez, Alaska and Long Beach, California.
- 030624 - A CPR-Based Survey to Monitor the Gulf of Alaska and Detect Ecosystem Change – S. Batten. This project continues, and further develops, the Continuous Plankton Recorder surveys from Ships of Opportunity begun in 2000 through the North Pacific Marine Research Initiative and continued through 2002 under GEM (project 02624). The project will test the CPR as an almost real-time indicator of ecosystem change across the GOA (the ACC and offshore).
- 030640 - Toward Long-Term Oceanographic Monitoring of the Gulf of Alaska Ecosystem – T. Weingartner. Project supports a mooring measuring temperature and salinity at depth intervals at the site of the longest continuous time series of physical oceanographic data in Alaska waters, GAK1 (Seward Line Station One). Fluorescence has been added to the surface observations in response to a request for measure of biological activity relevant to understanding distribution of juvenile pink salmon.

030654 - Surface Nutrients over the Shelf and Basin in Summer – Bottom up Control of Ecosystem Diversity – P Stabeno This two-year project will measure nitrate over the shelf and basin as part of the NMFS-OCC/GLOBEC salmon survey in July/August of 2003 and 2004 Nutrient maps will be used to support NPZ models and satellite-derived models of nitrate and new production, to examine mechanisms of nutrient supply such as mixing over banks and transport up submarine canyons, and to assist resource management of salmon and other commercially important species

Tools and Strategies

Introduction

As explained in the GEM Program Document, the conceptual foundation is refined into a series of initial research questions through the use of tools (gap analysis, synthesis and research, modeling and data management, GEM Program Document Chapter 3) and the strategies of supporting management applications and fostering community involvement and local knowledge Tools and strategies transcend habitat type boundaries and are integral to the attainment of all GEM goals

Synthesis Needs and Schedule

A synthesis of scientific literature and existing data gathering programs is needed to serve as the introduction to the Science Plan sections for three of the four GEM habitat types the Alaska Coastal Current, nearshore and watersheds Bearing in mind that the boundaries of habitats are not rigidly drawn (Chapter 2, GEM Program Document), the synthesis effort should concentrate on one habitat type, however, each proposal must address linkages of its habitat type with the other habitat types

FY 04 Proposed Actions

- Alaska Coastal Current (ACC) synthesis would address recent advances in biology and physical sciences relevant to the ACC, discuss how recent advances might change existing concepts, point out leading and emerging hypotheses, and describe how these might support or change the Science Plan's working concepts for the habitat type
- Nearshore (Intertidal/Subtidal) synthesis document would build on the Science Plan and the design work of Schoch et al (2002a, see GEM Science Plan) to address recent advances in biology and physical sciences relevant to the nearshore and point to the opportunities and needs for establishing a geographically distributed network of monitoring sites
- Watershed synthesis builds on the watershed sections of the Science Plan and GEM Program Document to incorporate recent advances in biology and physical sciences It would address opportunities and needs for establishing watershed monitoring sites during FY 06

Modeling Needs and Schedule

Building the GEM model requires starting from existing physical and biological models, hence, the means of cooperation, coordination, integration and achieving cost efficiencies with existing modeling efforts. Procedures and strategies for interdisciplinary cooperation need to be defined, as well as ways and means of communicating the contents, functions and outputs from the model to a variety of different disciplines and across a variety of common operating systems. Data assimilation strategies for selecting time and space scales for biological and physical monitoring are essential.

FY 04 Proposed Actions

- Build the infrastructure necessary to create, develop and maintain the GEM Model as an interdisciplinary team of modelers is assembled with experience in biological and physical modeling in the Gulf of Alaska
- Describe the process of implementing the smaller, but critical, components of the GEM model such as SEA pink salmon survival model, in all aspects including field sampling, estimation of parameters from data, software, hardware, and data management and information transfer

Community Involvement and Management Applications Needs and Schedule

Projects in this category are designed to enlist the participation of specific communities in developing and/or implementing the GEM Program

Actions in FY 03

030636 - Commercial Fishing Management Applications – K. Adams and R. Mullins. This project is in the process of building bridges between the scientific community, which is describing and attempting to predict variation in biological production, and the commercial fishing community in Prince William Sound, which is attempting to find management applications for this new information. In addition, the project seeks to provide a fisheries community presence to participate in GEM development.

030575 - GEM Community Involvement. A team of community involvement specialists is expected to deliver the following products: 1) more detailed Community Involvement sections for each Habitat section, 2) and expansion of the Community Involvement section above to include (a) more detailed descriptions of those aspects of community involvement that span all components of a project (e.g., data management and the dissemination of results and information) and (b) discussion of characteristics shared by most or all community involvement projects that may differ significantly from projects driven by agencies or the academic community, and 3) recommendations for additions to the GEM Program Document concerning community involvement.

030670 - Monitoring dynamics of the Alaska coastal current and development of applications for management of Cook Inlet salmon – a pilot study. A team of a physical oceanographer and fisheries biologist will demonstrate the technical feasibility of using a vessel of opportunity to collect physical oceanographic and fisheries data along a transect across

lower Cook Inlet from Anchor Point to the Red River delta. If feasible, the data will be developed into information to inform salmon fishery managers in Cook Inlet in subsequent years.

Proposed Actions in FY 04

- Continue development of interdisciplinary fishery management applications in PWS, extend to Cook Inlet
- Develop a small-scale scientific symposium for coastal communities to serve those who are not able to travel to Anchorage for the annual EVOS sponsored symposia
- Produce GIS maps of resources for specific coastal communities
- Continue work with Public Advisory Committee, Scientific and Technical Advisory Committee and Subcommittees to ensure community involvement (staff)

Lingering Oil Effects

Introduction

The Trustee Council continues to be concerned about *Exxon Valdez* oil remaining in the marine environment and any effects it may be having on injured resources. Injured resources are identified and their current status described on the Trustee Council's web site, <http://www.oilspill.state.ak.us/facts/status.html>. Current objectives for the Lingering Oil Effects section of the Trustee Council's program are focused on examining the fate and effects of the remaining oil on injured resources and services and especially populations of two species in western Prince William Sound, harlequin ducks and sea otters. These populations have shown continuing exposure to hydrocarbons in localities where potentially toxic forms of the oil from the *Exxon Valdez* are known to persist. Objectives for FY 04 also include learning about the status of subsistence uses of the injured resources in the spill affected areas for comparison to a 1998 survey (Restoration Project 99471, Fall, J. A., and C. J. Utermohle 1999).

The reasons why some populations of injured species in Prince William Sound have not met the criteria established for their recovery in the nearly 14 years since the oil spill are still not clear. For some species it has not been possible to clearly separate the possible toxic effects of oiling from the possible effects of natural causes such as climate change and predation. For this reason, GEM projects that address injured species and ecosystems are designed to understand the effects of natural forces on populations and their productivity. The knowledge gained may permit at least a retrospective understanding of oil injury versus other impacts for species injured by *Exxon Valdez* oil, and provide the background on natural forces necessary to understand effects of oiling in future oil spills.

Information Gaps and Questions

Information gaps and questions remain regarding the fate and effects of *Exxon Valdez* oil in western Prince William Sound. The fate and effects of *Exxon Valdez* oil within populations of sea otters and harlequin ducks are of particular interest due to the continuing presence of oil from the *Exxon Valdez* in the intertidal areas where these species feed. Intertidal resources are also

important parts of subsistence harvest, so work on the status of subsistence activities in the spill affected areas is of interest. Development of the GEM Program is also a primary restoration activity in FY 04 addressing lingering oil effects.

Lingering Oil Research Needs and Schedule

Proposed actions in FY 04

- Identify bioavailability of lingering oil in Prince William Sound through studies of sea otters and harlequin ducks in the area
- Establish a strategy for monitoring persistence of *Exxon Valdez* oil, and its relationship to other sources of contamination in PWS
- Evaluate the status of subsistence uses by collecting, analyzing, and reporting information about current subsistence uses in a subset of oil spill area communities using methodology that is comparable with previous research results
- Continue development and implementation of the overall GEM Program

Alaska Coastal Current

Current Scientific Thinking

The deep waters of the central Gulf of Alaska contain high levels of nutrients, but the ecological mechanisms whereby the nutrients of the deep offshore waters are transformed into the animal biomass that fuels the human economies and cultures of southcentral Alaska are largely unknown. Much of the Gulf of Alaska is a very deep (circa 4000m) reservoir of salty water bearing carbon and nutrients that would fuel biological production if transported to the surface waters of the GEM habitat types. Paradoxically, the ocean processes such as thermohaline circulation and upwelling that transport deeper waters toward the relatively shallow depths appear to be absent or short-lived in the northern Gulf. The opposite condition from upwelling, coastal downwelling, is usually the case in the Gulf, particularly in winter. It is known that cross-shelf, surface Ekman transport in winter cannot account for the high nutrient concentrations observed on the inner shelf in spring (Childers 2000, Whitley 2000). Other mechanisms are possible. In summer, when downwelling relaxes, salty, nutrient-rich water from offshore invades the inner shelf (Royer 1975), but the annual extent of the invasion varies and may be controlled by forces with periods of approximately two decades (Parker et al. 1995). Vertical mixing is strong through the winter and redistributes fresh water, salt and possibly nutrients throughout the water column, so a combination of mechanisms possibly is involved in the annual nutrient re-supply to the inner shelf (GEM Program Document, Chapter 7.6.4).

Even though upwelling appears to occur only briefly in the Gulf (GEM Program Document, Chapter 7.6.2, Royer 1982, 2000, Reed and Schumacher 1986), the northern and western Gulf and adjacent waters are nonetheless highly productive of benthic, pelagic and littoral vertebrates (fish, birds and mammals) and benthic invertebrates such as crustaceans and mollusks (i.e. Feder and Jewett 1986, Cooney 1986, Martin 1997, Witherell 1999, Kruse et al. 2000, Rogers et al. 1986, Highsmith et al. 1994, Purcell et al. 2000, Rooper and Halderson 2000). Solving the mystery of the missing ecological mechanisms is essential to explain how the ingredients necessary for biological production of plants and animals (nutrients and food) are transported to

be converted into the populations of fish, shellfish, birds, and mammals that are the centers of attention for natural resource management agencies and coastal economies

A reasonable working concept, to be more fully stated below, starts with the processes that change the strength of the factors driving the currents of the region (GEM Program Document, Chapter 7 6 4) Both the area of the ACC and adjacent shelf and slope are strongly affected by advection (mostly horizontal transport of momentum, energy, and dissolved and suspended materials by ocean currents), implying that climate perturbations, even those occurring far from the GEM study area, can be efficiently communicated into the northwestern GOA by ocean circulation (GEM Program Document, Chapter 7 6 2, p 130) The strong advection also implies that processes occurring as far upstream as northwestern United States might substantially influence biological production within the GEM habitat types

Strong circumstantial evidence links changes in factors governing the strength of GOA currents in general, and the ACC in particular, to changes in biological production in all of the GEM habitat types Correlations between time patterns of changes in physical and biological phenomena provide some clues, but no solutions to our mystery Changes in populations of birds, fish and mammals inhabiting the ACC have been shown to be correlated with temporal changes in weather (Hare et al 1999, Mantua et al 1997, Anderson and Piatt 1999, Francis et al 1998) and forcing from the moon's gravity, lunar forcing (Parker et al 1995) Lunar tidal forcing with a period of 18 6 years has been associated with high latitude climate forcing, periodic changes in intensity of transport of nutrients by tidal mixing, and periodic changes in fish recruitment (Royer 1993, Parker et al 1995) Biological and physical effects of the lunar tidal cycle may extend beyond effects associated with tidal mixing in the nearshore habitat type About one-third of the energy input to the sea by lunar forcing serves to mix deep-water masses with adjacent waters such as the ACC (Egbert and Ray 2000)

Lunar forcing may reinforce the effects of weather patterns such as the Pacific Decadal Oscillation (PDO) or the El Nino Southern Oscillation (ENSO) on delivery of food and nutrients to surface waters of the ACC The lunar tidal cycle appears to be approximately synchronous with the PDO Changing weather patterns also alter the expression of the ACC (Royer 1981a) and can profoundly alter aspects of circulation (i e , upwelling and downwelling) and stability of the photic zone (vertical mixing) (GEM Program Document, Chapter 7 2 2 3)

In addition to the correlative evidence, strong direct evidence from major programs such as FOCI (Fisheries Oceanography Coordinated Investigations) and SEA (the Sound Ecosystem Assessment Program), as well as from independent investigations, links changes in factors governing the strength of ocean currents to changes in biological production in the GEM habitat types (Bailey et al 1999, Pearcy 2001, GEM Program Document, Chapter 7 10 4) The ever expanding body of scientific observations has been validated in mathematical models of the coupling between processes of biological production (i e , primary production, trophic transfers such as grazing and predation, and physical processes such as vertical mixing and advection) (GEM Program Document, Chapter 7 10 4, 8, and Appendix F) Taken as a whole, these new insights on how species of larger vertebrates interact with prey, predators and competitors, as well as how these associations among species are ultimately influenced by shifts in ocean climate and human activities, form a new gateway to understanding the ecosystems of the GEM habitat types The mechanisms identified, measured and validated so far all point to factors associated with the dynamics of the Alaska Coastal Current and adjacent waters as sources of the ecological mechanisms controlling biological change in the GEM habitat types These mechanisms work

through control of the rate of input and distribution of nutrients and food, with concomitant or subsequent effects on grazing and predator-prey relationships

The SEA Program measured ocean conditions, primary production and distributions of food and predators in the nearshore and ACC habitat types of Prince William Sound. Sampling was defined by hypotheses regarding regulation of food production and trophic transfers, and the hypotheses were tested through modeling. Forcing by spring winds was found to be instrumental in determining the magnitude in upper-layer zooplankton biomass during the 1990s, and overall, between 1981 – 1997 it is likely that the standing stock of zooplankton in Prince William Sound was influenced by both periodic advection and nutrient-constraining processes (Eslinger et al 2001). Linkages of wind forcing, nutrient delivery mechanisms and advective processes to juvenile pink salmon survival were identified through the profound effects of zooplankton density on feeding behavior of the salmon's predators, and on the growth and behavior of salmon (Willette et al 2001). Processes of starvation and predation vary as the leading mechanisms of mortality for Pacific herring and pink salmon although the timings of critical events differed substantially between the species (Cooney et al 2001a). Further direct evidence linking changes in factors governing the strength of ocean currents to changes in biological production in the GEM habitat types comes from the FOCI Program in the Shelikof Strait area near Kodiak. FOCI has achieved an understanding of the effect of oceanographic conditions as mechanisms controlling survival and recruitment of a commercially exploited fish species (walleye pollock, *Theragra chalcogramma*). The understanding is sufficiently well developed to allow it to contribute to the management of the species (Megrey et al 1996).

ACC Working Concept

The working concept that will be used to guide research and monitoring in the GEM ACC habitat is

The Alaska Coastal Current is the region of the GOA through which momentum, energy, nutrients and food originating in deeper waters, waters farther offshore, and upstream are distributed to surface waters, the nearshore, downstream and ultimately to watersheds. Distribution mechanisms for nutrients and carbon and pathways are thought to link the offshore to the nearshore and watersheds through the Alaska Coastal Current (GEM Program Document, Chapter 7.6.3). Changes in advective processes within the ACC, brought about by periodic and aperiodic changes in climate, and by periodic changes in the input of energy, control production of animals and structure food webs across all the habitat types on decadal scales by limiting the amounts, distribution mechanisms, rates of distribution, and pathways for nutrients and food.

The ACC potentially is important to the circulation dynamics of Prince William Sound, clearly, it is a critical advective and migratory path for material and organisms between the Gulf of Alaska and PWS, and it is likely to play similar roles in lower Cook Inlet, Shelikof Strait and eastern Kodiak. A collection of related research questions and hypotheses is included in the GEM Program Document Appendix H. Some statements from the ACC working concept are as follows

- Ocean and coastal currents control availability and long-term average rate of delivery of the basic factors essential to animal growth food and energy
- Populations of birds, fish and marine mammals in southcentral Alaska are determined by cross-shelf transport of nutrients
- Changing environmental conditions directly alter primary production, which is reflected up through the food chain to affect harvests by top predators, including man
- Organisms are adapted to certain environmental conditions Altered environmental conditions shift the balance and efficiency of ecosystems via survival or migration to affect harvests by top predators
- Data collected from technology placed on vessels of the Alaska Marine Highway system can identify relationships between the ACC and populations of key species and can detect change in these populations as a result of changes in the ACC

Information Gaps and Questions

At present a relatively large number of relevant surface atmospheric, and marine data gathering projects are active in the ACC habitat type, however, most of these are of uncertain duration GEM presently supports two long time series moorings to collect temperature, salinity, fluorescence, and current vectors below the sea surface GEM is developing a project to enhance abilities to use optical data from satellites for modeling efforts Time series from a ship of opportunity for temperature, salinity, fluorescence, zooplankton, and phytoplankton are supported by GEM in the ACC and offshore Other agencies support a variety of projects of limited duration or annually appropriated which collect a wealth of information on physical and biological oceanography, including currents, phytoplankton, zooplankton, and juvenile salmon

Nonetheless, relatively few long-term monitoring projects collecting data below the sea's surface are active, although the National Weather Service marine stations and satellite coverage provide long-term monitoring on atmospheric and sea surface conditions Some types of satellite observations can be occluded by clouds, which is a common event in the Gulf of Alaska (see GEM Program Document, Appendix D and sections below on EVOSTC and Non-EVOSTC ACC-related projects by agency) Measurements of the physical and biological properties and ecological mechanisms that control animal population growth are major gaps in knowledge that need to be filled before the goals of the GEM Program can be attained In a review of fisheries oceanography literature, Cooney et al (2001b) concluded that most studies of fish population recruitment dynamics were unable to explain mechanistic linkages between fish production and changes due to either human actions or natural forcing Where do we look to fill the gaps? Detecting and understanding temporal changes in the strength of downwelling, upwelling vertical mixing, and their effects on the distributions of food and nutrients are essential to understanding changes in populations of birds, fish and mammals Corresponding changes in the distribution of food and nutrients are expected to be expressed in changes in salinity, temperature, marine current vectors, surface wind vectors, and sea levels, and are expected to be essential to understanding changes in populations of birds, fish and mammals

Gaps in knowledge on the effects of the ACC and factors that are covariates and proxies for the distribution of nutrients and food in the GEM habitat types extend to important adjacent water bodies Prince William Sound, Cook Inlet and Shelikof Strait For example, much of the available evidence points to Prince William Sound as an important part of the Gulf of Alaska ecosystem (cf Eslinger et al 2001), but the biological and physical mechanisms which enable

numerous species of organisms and nutrients to be exchanged between shelf waters and the Sound are poorly understood. Prince William Sound has a large central basin of about 60 by 90 km with depths of 350 – 750 m that has been shown to serve as a repository for nutrients and food transported from the ACC and Alaska Current, but the seasonality and sources of variability influencing this exchange are largely unknown (Schmidt 1977, Niebauer et al 1994, Gay and Vaughan 2001, Cooney et al 2001b)

Gaps in knowledge of water circulation patterns within and nearby Prince William Sound limit the understanding of what controls biological production of high profile species such as pink salmon and herring in the Sound (Cooney et al 2001a). The basic concept that flow of surface waters through the Sound is generally counterclockwise with shelf waters entering through Hinchinbrook Entrance in the east and exiting through Montague Strait in the west appears to be an ideal that is often violated (Vaughan et al 2001). The knowledge of the extent and seasonality of communication of the Sound's water masses with the continental slope through Hinchinbrook Entrance via Hinchinbrook Canyon is vital to understanding origins of biological production in the Sound, as well as to understanding the mechanisms by which the rich nutrients and food of the Alaska Current and Subarctic Gyre reach the ACC, nearshore, and watershed habitats (Niebauer et al 1994, Vaughan et al 2001). Is the Hinchinbrook Canyon an advective pathway linking the offshore to the other GEM habitat types? Reliable transport estimates of mass and property exchanges between the sound and the shelf are not available. Is it possible to verify the observations of Niebauer et al (1994) that suggest that as much as 40 percent of the sound's volume is exchanged in summer (May – September) and 200 percent of the volume is exchanged in winter (October through April)?

Example Research Questions *What are the relative roles of local nutrient recycling versus deep-water supply and cross-shelf transport in Prince William Sound, Cook Inlet and Kodiak Island? Does the intense upwelling in outer Cook Inlet vary significantly interannually or interdecadally? Do long-term changes in some tidal nodes (e.g., an 18.6-year nodal cycle) affect nutrient supply in this region? Are PWS, Cook Inlet and the Kodiak shelf net importers or net exporters of nutrients, carbon and energy? What combinations of physical conditions and primary and secondary production lead to favorable conditions for higher trophic level consumers (fish, birds and mammals), and what is the spatial and temporal variability and frequency of occurrence of these combinations? (see Appendix H for other examples)*

GEM ACC Research Needs and Schedule

GEM research and monitoring in the ACC has two basic needs. The first need is to establish long-time series of physical and biological measurements (temperature, salinity, fluorescence, nitrates, silicates, zooplankton and nekton) on the role of the ACC in transporting nutrients and influencing primary and secondary productivity. The variables will be chosen to serve in the GEM model, which serves to develop a comprehensive understanding of the Gulf of Alaska's ecosystems. Using vessels of opportunity, such as those of the Alaska Marine Highway System, would provide a low cost alternative to chartered vessels and moorings. Privately owned vessels may be encouraged to participate in GEM due to a program operated by the Alaska Department of Environmental Conservation (ADEC). Non-tank vessels are required to file a Non-Tank Vessel Plan under the Oil Discharge Prevention and Contingency requirements of the ADEC (18

AAC 75 400 - 18 AAC 75 496) Participating in the GEM Program may qualify privately owned marine vessels such as passenger vessels, container ships and general cargo vessels for oil spill prevention credits issued by the ADEC (18 AAC 75 443) Such credits allow financial savings for vessel owners, as it lengthens the time for the ADEC inspection cycle by two years (from three to five)

As the cost of making these basic measurements becomes clear through assimilation of data into the GEM model, the frequency and spatial scale of sampling may be adjusted The second need for the GEM ACC program is to develop the GEM model (GEM Program Document, Chapter 8, NRC 2002) through developing the ability for GEM to collaborate with existing programs and models

GEM research needs in the ACC are

Detect Initiate development of the long-time series of physical and biological measurements in the ACC in support of the GEM ecosystem model The GEM Program will continue to work on developing a method for collecting data on the flow of currents into and out of Prince William Sound

Actions in FY 03

030624 and 030614 - Further develop the Continuous Plankton Recorder, thermosalinograph and fluorometer surveys from Ships of Opportunity

030654 - Monitor nitrate over the shelf and basin as part of the NMFS-OCC/GLOBEC salmon survey in July/August 2003

Proposed Actions in FY 04

- Maintain support for the Seward GAK1 time series, PWS current monitoring, continuous plankton recorder, thermosalinograph, and fluorometer on vessels of opportunity Investigate possibilities for real time data extraction
- Evaluate options for partnering with the Alaska Marine Highway System for thermosalinograph, fluorometer, and eventually nutrient monitoring on ferry routes throughout the northern GOA
- Continue to monitor nitrate over the shelf and basin as part of the NMFS-OCC/GLOBEC salmon survey in July/August 2004
- Analyze information needed to support resource and environmental management decisions for human activities in ACC

Detect Develop synoptic data on physical oceanography and fisheries dynamics of the ACC in preparation for long-term development of the ability to apply physical oceanographic data to operational fisheries management problems in Cook Inlet

Actions in FY 03

030670 - Initiate development of interdisciplinary fisheries oceanography measurement project at Anchor Point in Cook Inlet to understand dynamics of Alaska Coastal Current in relation to management of sockeye salmon fishery

Proposed Actions in FY 04

- Continue development of interdisciplinary fisheries oceanography measurement project at Anchor Point in Cook Inlet to understand dynamics of Alaska Coastal Current in relation to management of sockeye salmon fishery

Understand

Proposed Actions in FY 04 and beyond

- Long-term understanding will be developed through an ecosystem model that links biological and physical observations across the habitat types and the North Pacific to understand changes in single species of interest to managers and concerned others. The understanding includes how natural changes (e.g., climate change) will affect the ACC and how changes in the ACC will in turn affect key organisms, (birds, fish and mammals) and activities of interest to humans such as fisheries

Inform

Actions in FY 03

- 030636 - Build bridges between the scientific community, which is describing and attempting to predict variation in biological production, and the commercial fishing community in Prince William Sound, which is attempting to find management applications for this new information
- 030670 - Develop partnerships with fishery managers in Cook Inlet to apply synoptic physical oceanography and fishery catches to regulatory process

Proposed Actions in FY 04

- Develop a web based system for distributing information and peer reviewed, author-attributed data sets from the GEM program
- Establish web pages for each habitat and the GEM Model (Cross Habitat activities) on the EVOS web site. Web page to contain relevant EVOS publications, reports, data sets, and other information
- Provide links to web sites displaying graphical information with data from current projects, including Seward Line Station 1 (GAK1), Continuous Plankton Recorder, thermosalinograph and fluorometer

Proposed Actions in FY 05 – FY 07

- Make all data from the ACC projects available as soon as practicable over the web in a format convenient to most users

Solve

Proposed Actions in FY 04

- Initiate GEM biophysical model development
- Continue process of establishing operational fisheries oceanography programs in Cook Inlet Develop relationships with fishery managers in Cook Inlet in preparation for long-term development of fishery management tools, and to coordinate GEM ecosystem model development with fishery management needs

Proposed Actions in FY 05 and beyond

- Combine data on human impacts on fish species (catch) with oceanography and climate to provide advice on when to schedule fishing periods in Cook Inlet
- Develop advice to fishery and hatchery managers in Prince William Sound on prospects for adult returns of pink salmon

Predict All GEM efforts are pointed toward developing a comprehensive understanding of the ecosystems of the Gulf of Alaska that will permit prediction of changes in abundance of valued marine resources

Proposed Actions in FY 05 – FY 07

- Routine short-term predictions, such as timing of arrival of fish on fishing grounds in response to weather patterns shortly before the start of the season, should be possible within about five years, with the first predictions coming as early as FY 05
- Predictions of levels of pink salmon returns to Prince William Sound one year ahead may be possible within the FY 05 – FY 07 time frame, depending on availability of funding Note that the uncertainties associated with a one-year-ahead forecast are many times greater than with a forecast covering a few days or weeks
- Extension of forecasting to other species, and to longer time frames will require decadal scale efforts and patience

EVOSTC ACC-Related Projects

- 030614 - A monitoring program for near-surface temperature, salinity, and fluorescence fields in the Northeast Pacific Ocean – S Okkonen The objective for this proposed research is to maintain and upgrade a thermosalinograph and fluorometer, installed on a crude oil tanker, to continue research on acquisition of continuous, long-term measurements of the near-surface temperature, salinity, and fluorescence fields in the Alaska Coastal current and offshore areas of the Gulf of Alaska
- 030624 - A CPR-Based Survey to Monitor the Gulf of Alaska and Detect Ecosystem Change – S Batten This project continues, and further develops, the Continuous Plankton Recorder surveys from Ships of Opportunity begun in 2000 through the North Pacific Marine Research initiative and continued through 2002 under GEM (project 02624) The project will test the CPR as an almost real-time indicator of ecosystem change across the Gulf of Alaska (the ACC and off-shore)
- 030654 - Surface nutrients over the Shelf and Basin in Summer - Bottom up Control of Ecosystem Diversity – P Stabeno This two-year project will monitor nitrate over the shelf and basin as part of the NMFS-OCC/GLOBEC salmon survey in July/August of 2003 and 2004 Nutrient maps will be used to support NPZ models and satellite-

derived models of nitrate and new production, to examine mechanisms of nutrient supply such as mixing over banks and transport up submarine canyons, and to assist resource management of salmon and other commercially important species

- 030636 - Commercial Fishing Management Applications – K Adams and R Mullins This project is in the process of building bridges between the scientific community, which is describing and attempting to predict variation in biological production, and the commercial fishing community in Prince William Sound, which is attempting to find management applications for this new information. In addition, the project seeks to provide a fisheries community presence to participate in development of GEM
- 030640 - Toward Long-Term Oceanographic Monitoring of the Gulf of Alaska Ecosystem – T Weingartner Project supports a mooring measuring temperature and salinity at depth intervals at the site of the longest continuous time series of physical oceanographic data in Alaskan waters, GAK1 (Seward Line Station One). Fluorescence has been added to the surface observations in response to a request for measure of biological activity relevant to understanding distribution of juvenile pink salmon

Non-EVOSTC Projects

Narrative

The monitoring and research efforts of GEM should be viewed within the context of complementary data gathering activities, retrospective data sets and models of potential partner agencies in the Coastal Gulf of Alaska. Persons submitting proposals, reviewing proposals and administering ongoing research and monitoring projects should routinely compare proposed and ongoing activities to the list of Non-EVOSTC projects by agency, as a first step toward the coordination and leveraging goals of GEM for all projects. When similar items are found, additional information on the projects is available in databases of GEM and other databases and agencies (i.e., CIIMMS, PMEL and PICES) through links on the GEM website or directly from the agencies. A brief introduction to non-EVOSTC data sources and how they may be used in the GEM ACC Program follows.

In the Alaska Coastal Current, projects of the National Marine Fisheries Service (NMFS) provide a wealth of historical and current observations on occurrence and abundance of a large number of fish and invertebrate species. In addition NMFS has models of physical and biological oceanography in relation to fisheries, in cooperation with other parts of the National Oceanic and Atmospheric Administration (NOAA). Of particular interest for controlling the costs of monitoring in the ACC is the availability of research ship time onto which additional observations might be added. Long-term stable research cruises of interest are the vessel-based transects of the Ocean Carrying Capacity Study (NMFS) which cross the continental shelf and shelf break in the Gulf of Alaska, the area and depth stratified trawls of the NMFS biennial surveys which cover the shelf and the shelf break to a depth of 1000m, and the vessel-based surveys of the International Pacific Halibut Commission (IPHC) on the shelf and coastal embayments throughout the Gulf of Alaska.

ACC projects should be cognizant of the opportunities presented by the long-term, real time atmospheric and surface ocean physical data of the National Weather Service (NWS). NWS maintains weather stations of potential interest to GEM on both moorings and coastal land sites. The potential for partnering with NWS through the National Data Buoy Center (NDBC) by adding instrumentation to moorings and coastal stations that can be communicated through the

real-time data communication systems should be considered when planning new projects or re-evaluating ongoing projects

Limited time length efforts funded by the National Science Foundation (NSF) and other federal entities should be consulted in the preparation and evaluation of GEM proposals and projects. For example the short-term efforts of the GLOBEC program (multi-institutional NSF and NOAA-funded) are producing plankton, fish, physical, and chemical observations in the ACC and offshore habitat types through calendar 2005. Other NSF-funded programs, such as the Gulf of Alaska Recirculation Study (GARS) provide a wealth of information for syntheses, including retrospective analyses and modeling. Another source of fixed-term oceanographic and atmospheric data for the Gulf of Alaska is the Oceanic and Atmospheric Research (OAR) arm of NOAA, which has ongoing research interests in the Gulf of Alaska.

Remote sensing data sources should be routinely consulted as a means to reduce long-term data acquisition costs for proposed and ongoing GEM activities. For example the National Aeronautics and Space Administration (NASA) has compiled time series information on sea surface conditions in the Gulf of Alaska through its U.S. Global Climate Research Program (USCGRP). NOAA's National Environmental Satellite Data Service (NESDIS) has online terrestrial, coastal and marine data available as free downloads from its National Geophysical Data Center (NGDC) web site.

List by Agency

- IPHC - Long line fishing grid surveys of coastal Alaska
- NESDIS - National Geophysical Data Center (NGDC), GSHHS - A Global Self-consistent, Hierarchical, High-resolution Shoreline Database
- NMFS - Ocean Surface Current Simulator Model (OSCURS)
- NMFS - Ocean Carrying Capacity Study (OCC)
- NMFS - Master Oceanographic Observational Data Set (MOODS), Extensive Oceanographic Profile Data, All Oceans
- NMFS - West Coast Upwelling Indices Data Files
- NMFS - Pavlof Bay Temperature Recording Mooring
- NMFS - Shelikof Strait FOCI
- NOAA - GLOBEC Northeast Pacific Program Retrospective Analysis of Growth Rate and Recruitment for Sablefish, *Anoplopoma fimbria*, from the Gulf of Alaska and the California Current System
- NOAA - GLOBEC Northeast Pacific Program Analysis of Ichthyoplankton Abundance, Distribution, and Species Associations in the Western Gulf of Alaska
- NOAA - GLOBEC Northeast Pacific Program Long-term Variability in Salmon Abundance in the Gulf of Alaska and California Current Systems
- NOAA - GLOBEC Northeast Pacific Program A Retrospective Study of Top Predator Trophic Positions, Productivity, and Growth in the Gulf of Alaska for 1960-75 and 1975-90
- NOAA - GLOBEC Northeast Pacific Program Patterns, Sources and Mechanisms of Decadal-Scale Environmental Variability in the Northeast Pacific A Retrospective and Modeling Analysis
- NOAA - GLOBEC Northeast Pacific Program Remote Sensing of the Northeast Pacific Retrospective and Concurrent Time Series Analysis Using Multiple Sensors on Multiple Scales

NOAA - GLOBEC Northeast Pacific Program Physical-Chemical Structures, Primary Production and Distribution of Zooplankton and Planktivorous Fish on the Gulf of Alaska Shelf

NOAA - GLOBEC Northeast Pacific Program Retrospective Analysis of Northeast Pacific Microzooplankton

NOAA - GLOBEC Northeast Pacific Program Coupled Bio-Physical Models for the Coastal Gulf of Alaska

NOAA - GLOBEC Northeast Pacific Program Coupled Bio-physical Models for the Coastal Gulf of Alaska

NOAA - GLOBEC Northeast Pacific Program Retrospective Analysis of Northeast Pacific Microzooplankton A Window on Physical Forcing of Food Web Structure

NPRB - A continuous plankton recorder monitoring program for the eastern North Pacific & southern Bering Sea

NWS - Buoy Observations

NWS - Coastal-Marine Automated Network (C-MAN)

NWS - Moored Buoys

NWS - SeaBreeze CD-ROM

OAR (NOAA) - Distribution and Elemental Composition of Suspended Matter in Alaskan Coastal Waters

OAR (NOAA) - On Exchange of Water Between the Gulf of Alaska and the Bering Sea through Unimak Pass

OAR (NOAA) - Gulf of Alaska CTD Data Collected under the Environmental Services Data and Information Management (ESDIM) Data Rescue

OAR (NOAA) - Bering Sea and Gulf of Alaska Winds (1946-1982)

NSF - Gulf of Alaska Recirculation Study (GARS)

NSF - Upper Ocean Circulation in the Subpolar and Northern Subtropical Pacific

USGCRG - Repeat Hydrography and Special Analysis Centre

USGCRG - One-Time Survey Cruise 17N

USGCRG - Subsurface Floats

USGCRG - Surface Drifting Buoys

USGCRG - Joint Archive for Shipboard Acoustic Doppler Current Profilers (ADCP)

USGCRG - Upper Ocean Thermal Data

USGCRG - Sea Surface Salinity

USGCRG - Surface Meteorological Data and Surface Fluxes

USGCRG - Tide Gauges

UAF - GAK 1 TIME SERIES

UAF - Process modeling of the Alaska Coastal Current

UAF - Physical forcing of marine productivity monitoring moorings on the Gulf of Alaska shelf

Nearshore

Current Scientific Thinking

Basic scientific concepts of how ecosystems in the nearshore (intertidal and subtidal) are structured by physical and biological phenomena have been well developed for some time (GEM Program Document, Chapter 7.9, Ricketts 1939). For the organization of sampling strategies, the most fundamental substratum distinctions are hard bottom (rocks, boulders, cobbles) and soft bottom (mobile sedimentary habitats like sands and muds). Within these two types, geomorphology varies substantially, with biological implications that often induce further habitat partitioning (Page et al. 1995, Sundberg et al. 1996).

Intertidal

The rocky intertidal ecosystem may represent the best understood natural community of plants and animals on earth. Ecologists realized more than forty years ago that this system was uniquely well suited to experimentation because the habitat was accessible and basically two-dimensional, and the organisms were manipulable and observable. Consequently, ecological science has used sophisticated experimental manipulations to produce a detailed understanding of the complex processes involved in determining patterns of distribution and abundance of rocky intertidal organisms (Paine et al. 1996, Dayton 1971, Connell 1972, Underwood and Denley 1984). Plants and animals of temperate rocky shores exhibit strong patterns of vertical zonation in the intertidal zone. Physical stresses tend to limit the upper distributions of species populations and to be more important higher onshore, competition for space and predation tend to limit distributions lower on the shore. Surface space for attachment is potentially limiting to both plants and animals in the rocky intertidal zone. In the absence of disturbance, space becomes limiting, and competition for that limited space results in competitive exclusion of inferior competitors and monopolization of space by a competitive dominant. Physical disturbance, biological disturbance and recruitment limitation are all processes that can serve to maintain densities below the level at which competitive exclusion occurs (Menge and Sutherland 1987). Because of the importance of such strong biological interactions in determining the community structure and dynamics in this system, changes in abundance of certain keystone species can produce intense direct and indirect effects on other species that cascade through the ecosystem (Menge et al. 1994, Wootton 1994, Menge 1995, Paine et al. 1996).

Intertidal communities occupying unconsolidated sediments (sands and muds) are quite different from those found on rocky shores (Peterson 1991). These soft-bottom communities are composed of infaunal (buried) invertebrates, mobile microalgae and abundant transient consumers, such as shorebirds, fishes and crustaceans (Rafaelli and Hawkins 1996). Macroalgae are sparse and found attached to large shell fragments or other stable hard substrata. In very low energy environments, large plants, such as salt marsh grasses and forbs high on shore and seagrasses low on shore, occur in intertidal soft sediments (Peterson 1991). The large stretch of intertidal soft-sediment shore between those vegetated zones has an empty appearance, which is misleading. The plants are microscopic and productive, the invertebrate animals are buried out of sight. The soft-bottom intertidal habitat represents a critically important feeding ground, especially for shorebirds, because the flat topography allows easier access than is provided by steep rocky coasts and because invertebrates without heavy protective calcium carbonate shells are common, particularly polychaetes and amphipods (Peterson 1991).

The intertidal shorelines of the GOA exhibit a wide range of habitat types. True soft-sediment shores are not common, except in Cook Inlet. Marshes, fine-grained and coarse-grained sand beaches, and exposed and sheltered tidal flats represent a small fraction of the coastline in the GOA. Sheltered and exposed rocky shores, wave-cut platforms, and beaches with varying

mixtures of sand, gravel, cobble, and boulders are the dominant habitats in this region (Page et al 1995, Sundberg et al 1996) Abundance, biomass, productivity, and diversity of intertidal communities on the shores of the eastern GOA with nearby glaciers are depressed by proximity to sources of runoff from glacier ice melt The islands in PWS and the Aleutian Islands, for example, have richer intertidal communities than the mainland of the northeast GOA, and the intertidal communities of Kodiak and Afognak tend to be richer than those of the Shelikof Strait mainland on the Alaska Peninsula (Bakus 1978, Highsmith et al 1994) Glacier ice melt depresses intertidal biotic communities by introducing turbidity and freshwater stresses

Winter ice scour seasonally denudes epibiota along the Cook Inlet shores (Bakus 1978) Intense wave exposure can cause substratum instability on intertidal cobble and boulder shores, thereby removing intertidal epibiota directly through abrasion (Sousa 1979) Shores with well rounded cobbles and boulders have accordingly poorer intertidal biotas than those with reduced levels of physical disturbance Bashing from logs also represents an agent of disturbance to those rocky shores exposed to intense wave action in this region (Dayton 1971) Consequently, exposed rocky coastlines may experience more seasonal fluctuations in epibiotic coverage than communities on similar substrata in protected fjords and embayments (Bakus 1978)

Subtidal

Although narrow, the shallow subtidal zone in which primary production does occur is of substantial ecological significance Many of these vegetated habitats, especially seagrass beds, macrophyte beds and kelps, provide nursery grounds for marine animals from other habitats, unique habitat for a resident community of plant-associated animals, and feeding grounds for important consumers, including marine mammals, seaducks, and many fishes and shellfishes, and a source of primary production for export as detritus to the deeper unlit seafloor ecosystem (Schiel and Foster 1986, Duggins et al 1989) In the spill area, eelgrass (*Zostera marina*) beds are common in shallow sedimentary bottoms at the margins of protected embayments (McRoy 1970), whereas on shallow rocky subtidal habitats, the kelps *Agarum*, *Laminaria*, and *Nereocystis* form dense beds along a large fraction of the coast (Calvin and Ellis 1978, SAI 1980, Dean et al 1996a) Productivity estimates in wet weight for larger kelps *Nereocystis* and *Laminaria* in the northeastern GOA range up to 37 to 72 kg/m²/yr (O'Clair and Zimmerman 1986) In this shallow subtidal zone, primary production also occurs in the form of single-celled algae These microbial plants include both the phytoplankton in the water column and benthic microalgae on and in the sediments and rocks of the shallow sea floor Both the planktonic and benthic microalgae represent ecologically important food sources for herbivorous marine consumers The typically high turnover rates and high food value of these microalgal foods in the shallow subtidal zone help explain the high production of invertebrate and vertebrate consumers in this environment

The sessile or slow-moving benthic invertebrates on the sea floor represent the bulk of the herbivore trophic level in the subtidal ecosystem This benthic invertebrate fauna in the shallow subtidal zone differs markedly as a function of bottom type (Peterson 1991) Rocky bottoms are inhabited by epifaunal benthic invertebrates, such as sponges, bryozoans, barnacles, anthozoans, tunicates, and mussels Sand and mud bottoms are occupied largely by infaunal (buried) invertebrates, such as polychaete worms, clams, nematodes, and amphipods The feeding or trophic types of benthic invertebrates vary with environment, especially with current flow regime (Rhoads and Young 1970) Under more rapid flows, the benthos is dominated by suspension feeders, animals extracting particulate foods out of suspension in the water column Under

slower flows, deposit feeders dominate the benthos, feeding on organic materials deposited on or in the seafloor

The benthos also includes some predatory invertebrates, such as sea stars (for example, leather star, *Dermasterias imbricata*, and sunflower star, *Pycnopodia helianthoides*), crabs (for example, helmet crab, *Telmessus cheiragonus*), some gastropods, and some scavenging invertebrates (Dean et al 1996b) Benthic invertebrates of soft sediments are distinguished by size, with entirely different taxa and even phyla occurring in the separate size classes Macrofauna include the most widely recognized groups such as polychaete worms, clams, gastropods, amphipods, holothurians, and seastars (Hatch 2001, Driskell et al 1996)

Meiofauna include most prominently in the GOA nematodes, harpacticoid copepods, and turbellarians (Feder and Paul 1980) Finally, microfauna include most prominently foraminifera, ciliates, and other protozoans Because the actual species composition of the benthos changes with water depth, the shallow and deep subtidal benthic faunas in the spill zone hold few species in common Soft sediment communities of Alaska are best described and understood in various locations within Prince William Sound, as a consequence of the intense study after the oil spill

The shallow subtidal rocky shores that are vegetated also include suites of benthic invertebrates unique to those systems These benthic invertebrates either directly consume the large plants, such as sea urchins, or else are associated with the plant as habitat Those species that depend upon the plant as habitat, such as several species of amphipods, crabs and other crustaceans, gastropods, and polychaetes, often are grazers as well, taking some mixture of macrophytic and epiphytic algae in their diets Grazing by sea urchins on kelps is sufficiently intense in the absence of predation on the urchins, especially by sea otters in the spill area, to create what are known as "urchin barrens" in which the macrophytic vegetation is virtually removed from the seafloor (Estes and Palmisano 1974, Simenstad et al 1978) In fact, this shallow subtidal community on rocky shores of the GOA represents the best example in all of marine ecology of a system controlled by top-down predation Sea otters control abundance of the green sea urchin, *Strongylocentrotus droebachiensis* When released from that otter predation, sea urchin abundance increases to create fronts of urchins that overgraze and denude the kelps and other macroalgae, leaving only crustose forms behind (Simenstad et al 1978) This loss of macroalgal habitat then reduces the algal associated invertebrate populations and the fishes that use the vegetated habitat as nursery These reductions in turn can influence productivity and abundance of piscivorous seabirds (Estes and Palmisano 1974) Recently, reduction of traditional marine mammal prey of killer whales has induced those apex consumers to switch to eating sea otters in the Aleutians, thereby extending this trophic cascade of strong interactions to yet another level (Estes et al 1998, Estes 1999) Consequently, the shallow subtidal community on rocky shores of the GOA is strongly influenced by predation and provision of biogenic habitat (Estes and Duggins 1995) Human disruption of the apex predators by hunting them (as historically occurred on sea otters, Simenstad et al 1978) or by reducing their prey (as may conceivably be occurring in the case of the Steller sea lions and harbor seals through overfishing their own prey fishes, NRC 1996) has great potential to create tremendous cascading effects through the shallow subtidal benthic ecosystem Furthermore, if concentration and biomagnification of organic contaminants such as PCBs, DDT, DDE, and dioxins in the tissues of apex predators, in particular in transient killer whales (Matkin unpublished data), causes impaired reproductive

success, then human industrial pollution has great potential to modify these coastal subtidal communities on rocky shores

The shallow subtidal community on rocky shores of the GOA is also strongly influenced by larval distribution and recruitment. Recent studies by the Partnership for the Interdisciplinary Study of Coastal Oceans (PISCO) (see GEM Program Document, Appendix A for web link) have shown that not only are the effects of competition and predation important in structuring benthic communities, but the sources and sinks of larvae are equally important. Larval abundance and behavior, where they come from, how they respond to ocean conditions, where they are retained, where they are reflected, and the dynamics regulating their recruitment are all important processes that ultimately control what lives where. Furthermore, knowledge about life histories is insufficient to make broad generalizations about the successes and failures of recruitment events.

The shallow subtidal benthic communities in soft sediments of the GOA region function somewhat differently from their counterparts on rocky substrata. These communities are important for nutrient regeneration by microbial decomposition and for production of benthic invertebrates that serve as prey for demersal shrimps, crabs and fishes. In some protected areas within bays, however, the shallow subtidal benthos is structured by emergent plants, specifically eelgrass in the GOA. These eelgrass beds perform ecological functions similar to those of macrophyte-dominated rocky shores, namely nursery functions, phytoplankton habitat roles, feeding grounds, and sources of primary production (Jewett et al. 1999). In the vegetated habitats of the shallow subtidal zone, the demersal fish assemblage is typically more diverse than and quite different from the demersal fishes of the deeper subtidal zone (Hood and Zimmerman 1986). In eelgrass (*Zostera*) beds as well as in the beds of small kelps and other macrophytes (*Agarum*, *Nereocystis* and *Laminaria*) in the GOA, juveniles of many species that live in deeper waters as adults use this environment as a nursery for their young because of high production of food materials and protection from predators afforded by the shielding vegetation (Dean et al. 2000). Furthermore, several fishes are associated with the plant habitat itself, including especially pickers that consume crustaceans and other invertebrates from plant surfaces, a niche that is unavailable in the absence of the vegetation. Both types of vegetated habitats in the shallow subtidal zone of the GOA contain larger predatory invertebrates, specifically seastars and crabs. In some cases, the same species occupy both eelgrass and kelp habitats (Dean et al. 1996).

Nearshore Working Concept

The working concept that will be used to guide research and monitoring in the GEM nearshore habitat is

Biological production and the structure of food webs in nearshore environments are controlled by local primary production, import of nutrients and food from watersheds, the Alaska Coastal current and the offshore, as influenced by predation, physical, and anthropogenic factors

Information Gaps and Questions

The consequences of change caused by various natural and human-driven factors on the structure and dynamics of the rocky intertidal communities are not well developed in the scientific

literature For example, human harvest by fisheries or subsistence users of important apex predators that exert top-down control on intertidal communities could cause substantial cascading effects through the system But the seastars and gastropods that are the strong predatory interactors in this community in the GOA region are not targets for harvest The mussels that are taken in subsistence harvest provide important ecosystem services as structural habitat for small invertebrates (Suchanek 1985), as a dominant space competitor (Paine 1966), and as a widely used prey resource (Peterson 2001), but mussels do not appear limited in abundance in the GOA region Perhaps some other harvested sessile invertebrate species, such as the black gumboot, would provide a more sensitive measure of long-term human impacts?

Little information exists on the dynamics of long-term change in structure and composition of intertidal communities in soft sediments anywhere Some of the best understanding of important processes actually comes from the northern GOA region The Alaska earthquake of 1964 had a tremendous influence on soft-sediment intertidal communities because of the geomorphological modifications of habitat (NRC 1971) Uplift of the shoreline around Cordova, for example, was great enough to elevate the sedimentary shelf habitat out of the depth range that could be occupied by many species of clams Clam populations in Cordova, a town once called the clam capital of the world, have never recovered from the earthquake The re-invasion of sea otters has similarly caused tremendous changes in clam populations in shallow soft-sediment communities of the northern GOA, mostly in subtidal areas, but also in intertidal sedimentary environments (Kvitek et al 1992)

Long-term nearshore monitoring programs exist in Cook Inlet (Kachemak Bay and Kasitsna Bay) and Prince William Sound (PWSRCAC multiple localities, Alyeska Valdez Arm, National Mussel Watch multiple localities) No program that is coordinated throughout the GEM region is presently operational Existing projects are targeted at human effects, or natural effects, but not both in the same locality

Current scientific thinking on what to study in the nearshore for GEM is guided by the results of an expert consultation and public involvement process (Schoch et al 2002a)

Answers are needed to the following questions

Is long-term monitoring of attributes (plants, animals, sediments, physical oceanography) of soft substrates, hard substrates, or some combination of the two likely to provide the best signal of decadal scale variability due to natural sources?

In consideration of existing programs and sampling strategies (NMW, PWSRCAC, OSRI, KBRR, USGS, PISCO), what are the appropriate localities and variables for detecting decadal scale changes in species diversity and productivity in the GEM region?

What are the best measures of human impacts over decadal scales, and what are these impacts, other than harvest, trampling, hydrocarbon pollution and organic enrichment?

How much more detailed shore zone mapping of which portions of the nearshore is needed in order to select GEM nearshore monitoring sites?

GEM Nearshore Research Needs and Schedule

The basic need for nearshore research and monitoring activities is a geographically distributed network capable of measuring decadal scale changes in oceanographic variables, habitat type, benthic community structure, human use, contaminant levels, and abundance of selected marine plants, mammals, birds, shellfish and fishes. GEM needs to develop a combination of synoptic, intensive, and extensive sites to monitor the above components at nested scales of space and time (Schoch et al 2002b). Intensive sites would be used for process oriented studies and to address questions linked to Gulf-wide hypotheses bearing on Cross Habitat connections. The purpose of extensive sites is to monitor key components of the ecosystem over larger spatial scales (i.e., study more sites less intensively). These sites would be used for pattern oriented studies and for addressing issues of concern to the local community. Developing means of matching sampling frequency to the appropriate temporal scale for the variables of interest is essential. Some portion of the sampling effort may be event driven.

Selecting variables in the nearshore will be guided by the GEM model (GEM Program Document, Chapter 8, NRC 2002), which serves as a repository for the current comprehensive understanding of the Gulf of Alaska's ecosystems. As the cost of making these basic measurements becomes clear through assimilation of data into the GEM model, the frequency and spatial scale of sampling may be adjusted.

In chronological order, GEM research needs in the nearshore are

Detect To detect decadal scale changes in species diversity and productivity in the nearshore in the GEM region, in consideration of existing programs and sampling strategies (NMW, PWSRCAC, OSRI, KBRR, USGS, PISCO) and using the best signal of decadal scale variability due to natural sources. What are the appropriate localities and variables for detecting changes in attributes (plants, animals, sediments, physical oceanography) of soft substrates, hard substrates, or some combination of the two?

Actions in FY 03

- 030687 - Develop a comprehensive historical perspective of locations and types of past studies conducted in the nearshore marine communities within Gulf of Alaska, and develop estimates of costs for each element of a proposed monitoring program
- 030666 - Initiate nearshore biodiversity studies along a pole-to-pole latitudinal gradient by applying protocols developed under the Census of Marine Life program
- 030647 - Evaluate the relative roles of natural factors (predation, grazing & natural variability) and anthropogenic impacts (harvest) in altering intertidal community structure, using the black chiton, *Katharina tunicate*, as a model
- 030623 - Collect baseline hydrocarbon data in mussel tissue and subtidal sediments that can be used to determine human impacts on the ecosystem
- 02395 - Develop pilot monitoring project for soft bottom habitats
- 02613 - Work with partners to identify coastal habitat mapping needs

Proposed Actions in FY 04

- Provide habitat mapping as necessary to support site selection for nearshore monitoring

- Continue projects to develop nearshore sampling sites
- Continue investigations of measures of human impacts (harvest and PAH)
- Analyze information needed to support resource and environmental management decisions for human activities in nearshore

Inform Develop a web based system for distributing information and peer reviewed author-attributed data sets from the GEM program

Proposed Actions in FY 04

- Establish web pages for each habitat and the GEM Model (Cross Habitat activities) on the EVOS web site Web page to contain relevant EVOS publications, reports, data sets, and other information
- Coordinate and facilitate interaction among investigators in nearshore projects to plan for FY 05 Invitation for Proposals

EVOSTC Nearshore Projects

A large growth in knowledge of the benthos of the GOA region was triggered by the EVOS in 1989 This work had broad geographic coverage of the rocky intertidal zone The area receiving the most intense study was PWS, where the spill originated Geographic coverage also included two other regions, the Kenai Peninsula-lower Cook Inlet and the Kodiak archipelago-Alaska Peninsula (Page et al 1995, Gilfillan et al 1995a, Gilfillan et al 1996b, Highsmith et al 1994, Highsmith et al 1996, Houghton et al 1996a, Houghton et al 1996b, Sundberg et al 1996) Some of this benthic study following the oil spill was conducted in other habitats (soft substrata, Driskell et al 1996) and at other depths (shallow and deep subtidal habitats Houghton et al 1993, Armstrong et al 1995, Dean et al 1996a, Dean et al 1996b, Dean et al 1998, Dean et al 2000, Feder and Blanchard 1998, Jewett et al 1999) Herring Bay on Knight Island in PWS was a site of especially intense monitoring and experimentation on rocky intertidal communities following the oil spill (van Tamelen et al 1997)

- 030687 - Monitoring in the Nearshore A Process for Making Reasoned Decisions – J Bodkin and J Dean This is a one-year project that began in FY 03 and this project will develop a comprehensive historical perspective of locations and types of past studies conducted in the nearshore marine communities within Gulf of Alaska, and develop estimates of costs for each element of a proposed monitoring program
- 030666 - Alaska Natural Geography in Shore Areas An Initial Field Project for the Census of Marine Life – B Konar This is a 3-year project which will receive its first year of funding in FY 03 The project will initiate near-shore biodiversity studies along a pole-to-pole latitudinal gradient by applying protocols developed under the Census of Marine Life program
- 030647 - Investigating the Relative Roles of Natural and Shoreline Harvest in Altering the Community Structure, Dynamics, and Diversity of the Kenai Peninsula's Rocky Intertidal – J Ruesink This is a 2-year project that began in FY 03 and this project will evaluate the relative roles of natural factors (predation, grazing & natural variability) and anthropogenic impacts (harvest) in altering intertidal community structure of the black chiton, *Katharina tunicata*
- 030623 - PWSRCAC-EVOS Long Term Environmental Monitoring Program – J Devens

This project was funded for one year beginning in FY 03. The project objective is to provide a program for the collection of baseline hydrocarbon data in mussel tissue and subtidal sediments that can be used to determine impacts of oil sources on the ecosystem. It is expected that the data from this project will assist in identifying potential monitoring sites for the GEM nearshore program.

- 030556 - High Resolution Mapping of the Intertidal and Shallow Subtidal Shores in Kachemak Bay – C. Schoch. This is a continuation of a field mapping project started in FY 02. This project will complete the field mapping and begin building a database of the geomorphology and physical attributes of shallow subtidal and intertidal habitats for the greater Kachemak Bay/Lower Cook Inlet area. It is expected that the data from this project will assist in identifying potential monitoring sites for the GEM nearshore program.
- 02613 - Mapping Marine Habitat –Prince William Sound to McCarty Fjord – J. Harper. This project conducted aerial video mapping of the coastal areas of the outer Kenai coast (McCarty Fjord to Prince William Sound) at extreme low tides employing the shore zone mapping protocols of the Washington ShoreZone mapping project, incorporating all of their features and new ones appropriate for Alaska. The results of this project will be available in December 2002. It is expected that the data from this project will assist in identifying potential monitoring sites for the GEM nearshore program.
- 02395 - Planning for Long-Term Monitoring in the Nearshore: Designing Studies to Detect Change and Assess Cause – C. Schoch. This project produced a draft nearshore monitoring plan that provides a framework for future monitoring that focuses on tractable components of the nearshore, and is statistically sensitive to temporal and spatial change. The plan is currently undergoing peer review.

Non-EVOSTC Projects

Narrative

The monitoring and research efforts of GEM should always be viewed through the complementary data gathering activities, retrospective data sets and models of potential partner agencies in the coastal Gulf of Alaska. Persons submitting proposals, reviewing proposals and administering ongoing research and monitoring projects should routinely compare proposed and ongoing activities to the list of Non-EVOSTC projects by agency, as a first step toward the coordination and leveraging goals of GEM for all projects. When similar items are found, additional information on the projects is available in databases of GEM and other agencies (CIIMMS, PMEL and PICES) through links on the GEM website or directly from the agencies. A brief introduction to non-EVOSTC data sources and how they may be used in the GEM nearshore habitat type follows.

Understanding of community composition and seasonal dynamics of GOA benthos was greatly enhanced over the past thirty years by research related to exploration and development of the oil and gas resources of the region. MMS, NOAA NMFS, and Alyeska funded geographically focused benthic survey and monitoring work in the 1970s. This work provided the first window into the quantitative benthic ecology of the region. Focus was most intense on lower Cook Inlet, the Aleutian Islands, the Alaska Peninsula, Kodiak Island, and northeast GOA, including Valdez Arm in PWS (Rosenberg 1972, Hood and Zimmerman 1986).

Currently long-term nearshore monitoring programs exist in Cook Inlet (Kachemak Bay and Kasitsna Bay) and Prince William Sound (PWSRCAC multiple localities, Alyeska Valdez Arm, National Mussel Watch multiple localities) In lower Cook Inlet, the upper Alaskan Peninsula at Shelikof Strait, and on the outer Kenai Peninsula, the National Park Service has planning well underway for a monitoring program in the nearshore and watersheds to be implemented in federal FY 2006 A draft NPS monitoring plan is due out in FY 05 Two NPS pilot projects in FY 03 are both of interest John Harper's video mapping and analysis of the coasts in Katmai (western shore of lower Cook Inlet) and Aniakchak (Alaska Peninsula shore of Shelikof Strait) and the Kachemak Bay Research Reserve survey of coastal data gathering programs in the vicinity of the parks Harper's project has already mapped 600 miles of coastline within the Lake Clark and Kenai Fjords parks

List by Agency

ADF&G - Kitoi Bay Monitoring, Center for Alaska Coastal Studies - Coast Walk program for Kachemak Bay

KBRR - NOS monitoring

NOAA - Mussel Watch Project

PWSRCAC - PAHs in mussels

NPS - Vital Signs Inventory and Monitoring Program - Southwest Alaska Network

UAF - Kasitsna Bay monitoring

Watersheds

Current Scientific Thinking

The importance of marine inputs to the watershed phase and of terrestrial inputs to the marine phase of regional biogeochemical cycle (GEM Program Document, Chapter 7 4 2 3 and 7 5) has been recognized for some time (Mathisen 1972, Chisholm 2000). For further discussion of effects of terrestrial exports to the marine environment, see the "Current scientific thinking" section in the nearshore habitat type. Comparison of paleoecological records spanning 2,200 yrs before the present time from anadromous and nonanadromous lakes using proxies of salmon abundance (^{15}N and diatom species composition) to the northern Gulf of Alaska (Karluk and Fraser Lakes on Kodiak Island) show the potential impact of salmon derived nutrients on freshwater ecosystems in the region (Finney et al. 2002). The higher incidence of ^{15}N indicative of higher salmon abundance in Karluk Lake was coincident with species of diatoms that are favored by eutrophic conditions. Oligotrophic species of diatoms were coincident with lower ^{15}N . Levels of ^{15}N were much lower in the nonanadromous Fraser Lake, where diatom species characteristic of oligotrophic circumstances were prevalent for almost the entire 2,200 year record. Artificial introduction of salmon to Fraser Lake, starting during the 1950s, was coincident with rises in ^{15}N and changes in species composition of diatoms. In an earlier paleoecological study of the same localities, Finney et al. (2000) speculated that commercial fisheries that started at the end of the nineteenth century were responsible for the downward trend in observed levels of ^{15}N in Karluk Lake from the late 1800s to present.

The results from paleoecological studies are confirmed by empirical evidence from experiments and direct observations in artificial and natural streams. *Chlorophyll a* and the biomasses of the biofilm (bacteria and molds) and aquatic macroinvertebrates, such as insects, increase as the amount of salmon carcass biomass increases. *Chlorophyll a* has been observed to increase over the full range of carcass biomass, whereas increases in macroinvertebrates stop at some limiting value of carcass loading (Wipfli et al. 1998, Wipfli et al. 1999). Salmon carcasses stimulate production of multiple trophic levels, including decomposers, in watersheds by providing carbon and nutrients. In earlier studies of an Alaskan stream containing Chinook salmon, Piorkowski (1995) supported the hypothesis of Wipfli et al. (1998) that salmon carcasses can be important in structuring aquatic food webs. In particular, microbial composition and diversity may determine the ability of the stream ecosystem to use nutrients from salmon carcasses, a principal source of marine nitrogen (GEM Program Document, Chapter 7 5). Marine nutrients and carbon move from the marine environment into terrestrial species in the watersheds of the GOA (Wipfli et al. 1999), as has been shown to be the case in anadromous fish-bearing watersheds elsewhere in the north Pacific region (Bilby et al. 1996).

All available evidence supports the concept that freshwater food webs in anadromous watersheds in the northern Gulf of Alaska and elsewhere are likely to be dependent to some extent on inputs of marine derived nutrients (MDN). It has been shown that a wide variety of terrestrial species that occur in the region bear MDN (^{15}N), such as river otter (Ben-David et al. 1998b), coastal mink (Ben-David et al. 1997a), riverine mink (Ben-David et al. 1997), wolf (Szepanski et al. 1999), and marten (Ben-David et al. 1997b), and riparian plants such as trees (Bilby et al. 1996). In a recent study of a salmon bearing stream in Washington State, Jauquet et al. (2002) documented the feeding of 30 species of birds, mammals, invertebrates, and fungi on chum

salmon carcasses In theory, any terrestrial plant or animal species that feeds in the marine environment or receives nutrients from anadromous fish, such as Harlequin duck or Sitka spruce, is a pathway to the watersheds for marine carbon and other elements in the form of nutrients

Human activities in watersheds can change the amounts and timing of the release of nutrients in watersheds from the terrestrial system into rivers and lakes by changing the seasonal and geographic patterns of runoff (Gordon et al 1992, Leopold et al 1995), destroying habitat for nodulated (nitrogen fixing) plants such as alders and lichens (Gunther 1989, Helfield and Naiman 2002), applying fertilizers to lawns and crops, and removals of anadromous fish such as eulachon and salmon The nitrogen associated with human activities comes from atmospheric sources (^{14}N), with the exception of impacts on anadromous sources, which involve changing levels of ^{15}N

Studying the levels of marine derived isotopes is the most certain way to distinguish between the biological effects of marine and freshwater processes Watersheds and the adjacent marine areas of the nearshore, the Alaska Coastal Current and the offshore are subject to common climatic forcing The effects of the cool ACC and the warmer Alaskan Stream moderate air temperatures GOA ocean temperatures are important in determining climate in the fall and early winter in the northern GOA and may be influential at other times of the year Because the cool glacially influenced waters of the ACC moderate air temperatures along the coast, the strength and stability of the ACC are important in determining climate in adjacent land areas, which means both watersheds and marine ecosystems are subject to common climatic forcing Primary natural forces are winds, tides, precipitation, and insolation

Since many of the major watersheds in the GEM region are in populated areas, they tend to be areas of relatively intense data collection by many different public and private entities Nonetheless, a major gap in knowledge that is not presently being addressed by anyone is the extent to which the functioning of specific watersheds in the GEM region may depend on marine inputs The available body of scientific evidence makes it clear that marine derived nutrients and carbon can be very important to the structure and function of ecosystems in the watersheds However, very little relevant data have been collected in watersheds of the GEM region that permit detection and understanding of these linkages

Watershed Working Concept

The working concept that will be used to guide research and monitoring in the GEM watershed habitats is

Ocean and coastal currents, especially the ACC, influence biological production in coastal watersheds by controlling availability and long-term average rate of delivery of marine nutrients and carbon to watershed flora and fauna and by controlling availability of nutrients and food in the marine habitats frequented by watershed species In turn, watersheds influence biological production in nearshore environments through the export of nutrients, food and pollutants

Watershed research and monitoring activities will be focused on establishing the degree to which levels of the isotopes common in the marine environment (carbon, nitrogen and sulfur), as measured in the tissues of plants and animals in watersheds, vary annually in response to annual

variations in the input of anadromous species. A component of the nearshore research is to look at the influence of watersheds on the nearshore.

The following statements are based on the working concept

- Levels of the isotopes of carbon, nitrogen and sulfur common in the marine environment, as measured in the tissues of plants and animals in watersheds, vary annually in response to annual variations in the input of anadromous species
- Plant and animal species may vary in the ratio of marine to non-marine isotopes (C, N, S) within watersheds due to their feeding habits and preferred feeding locality within the watershed. Examples of some species of interest which are expected to be different from one another in isotopic composition are willow (*Salix* spp.), banded kingfisher, dipper, northern pike (*Esox* spp.), and sockeye salmon (*Oncorhynchus nerka*)
- Plant and animal species may vary in the ratio of marine to non-marine isotopes (C, N, S) among watersheds due to the relative magnitude of terrestrial or atmospheric inputs, which is in turn related to the species composition and abundance of plant species. For example, the relative importance of atmospheric nitrogen is proportional to the activity of nodulated (nitrogen-fixing) plant species such as alders. Species such as juvenile sockeye salmon and sticklebacks should differ in isotopic composition among watersheds in highly forested watersheds such as the Kenai River, and in recently glaciated watersheds such as Delight and Desire Lakes
- Existing water quality monitoring programs may have information on nitrates and ammonium that would serve to establish marine linkages. Elevated nitrates and/or ammonium at certain localities and times of the year may provide an indication of levels of spawning anadromous fish
- Nourishment of watershed flora and fauna from marine sources means that freshwater production can be determined to some extent by the magnitude of marine inputs to freshwater habitats
- Nearshore production and community structure are influenced by transfers from the watershed of water, limiting nutrients, sediment, and organisms. These exchanges are measurable, for example, as signatures in isotopic composition, sediment records, tree rings, otoliths, and population records. The timing of glaciation, through its effect on abundance and species composition of riparian and other terrestrial vegetation in the watershed, should determine the relative composition of marine isotopes in the tissues of plants and animals

Information Gaps and Questions

No monitoring projects for marine-related linkages are presently operational, and only one research project (02649 Reconstructing Sockeye Populations in the Gulf of Alaska over the Last Several Thousand Years: The Natural Background to Future Changes) is directly measuring marine-related phenomena in the GEM area watersheds. This is a retrospective study of sockeye abundance in Prince William Sound and the Kenai River watershed using the stable isotope tracers present in the sediments of spawning lakes. The goal is to describe changes in sockeye salmon abundance over the last several millennia and to relate these changes to shifts in the climate/ocean system of the GOA and to human activities.

A second project (02612 Detecting and Understanding Marine-Terrestrial Linkages in a Developing Watershed Nutrient Cycling in the Kenai River Watershed) has recently been completed. This project has developed a draft Kenai River Watershed Study Plan that describes an integrated and interdisciplinary approach for understanding nutrient and energy pathways and terrestrial-aquatic linkages in the Kenai River Watershed. When final, the study is expected to contribute to the design of sampling for marine-related nutrients and food sources in the Kenai River watershed.

GEM Watershed Research Needs and Schedule

The focus of the GEM watershed program will be to conduct research on how to measure the known marine related indicators: stable isotopes of carbon, nitrogen and sulfur (C, N, S) and proxies for marine related sources of nutrients and food. Answers are needed to the following questions: What are the best indicators? Are C, N, and S equally useful as indicators of marine linkages in all types of watersheds? Are concentrations of nitrates and ammonium in freshwater suitable proxies for stable isotopes? Are there other suitable proxies for marine-related indicators? What is the variability of marine related indicators in bodily tissues among species within watersheds? Which species or species guilds are best suited to measuring marine linkages? How do suitable species vary among different types of watersheds, i.e., heavily forested, anadromous, non-anadromous, recently glaciated, heavy human development, pristine, and so forth? What are the indicators of terrestrial influences in nearshore marine environments?

Detect In concert with the development of the GEM biophysical model, a monitoring program to detect annual changes in levels of marine nutrients and carbon on biologically meaningful time and space scales in selected watersheds is to be designed and developed. Sampling of terrestrial signals in nearshore areas adjacent to watersheds may be incorporated. Sampling strategies must show how, if key variables are measured, recorded and made available to researchers with the proper spatial scale, temporal scale, cost effectiveness and technology, they will detect changes in the GEM ecosystem. Watersheds should be selected to permit such comparisons as volcanic to non-volcanic, heavily forested to recently glaciated, anadromous to non-anadromous, and developed to pristine.

Actions in FY 03

- 030596 - Provide bridge funding for Ninilchik River water flow gauge to allow time for permanent non-GEM funding to be obtained for stream flow recording
- 02649 - Use cores of sediments from sockeye-bearing lakes on the Kenai Peninsula and Prince William Sound to understand the natural variability of production in these systems in the distant past (up to 5,000y)
- 02612 - Participate in multi-institutional effort to plan watershed research in the Kenai River watershed in order to identify research opportunities and partners for GEM

Proposed Actions in FY 04

- Complete work and analyze cores of sediments from sockeye-bearing lakes on the Kenai Peninsula and Prince William Sound to understand the natural variability of production in these systems in the distant past (up to 5,000y)

- Identify and demonstrate statistically rigorous sampling strategies for detecting marine signals and proxies from plants and animals in the marine watersheds and nearby nearshore areas, including the use of existing water quality sampling programs that monitor human impacts
- Identify and demonstrate cost effective community based sampling strategies for citizen monitoring of marine-related variables and proxies in watersheds and nearby nearshore areas Action is to demonstrate how to incorporate proven approaches to community based monitoring of the aquatic environment, including QA/QC of citizen monitoring data

Proposed Actions in FY 05

- In those instances where the marine signal can be reliably and precisely measured, perform statistical design work, based on the data already collected to allow understanding of how much it would cost to field monitoring studies to detect changes of certain magnitudes in the marine signal on various temporal and spatial scales
- Identify and develop measures of ecological effects from human activities that can be applied in all watersheds where marine related variables are being developed

Proposed Actions in FY 06 – 07

- Using statistical methods and the watershed component of the GEM biophysical model, determine the efficacy of isotopic and proxy measures of MDN as an indicator of change in key watersheds across the GEM region
- Use watershed component of GEM biophysical model to begin development of a plan and cost estimates for a broad based systematic network to collect marine-related variables and proxies and essential physical data that focus comprehensive coverage (many variables, high precision) on a few key watersheds and synoptic coverage (few variables, lower precision) on a wide variety of watersheds across the GEM region
- Promote and facilitate partnerships with agencies, NGOs, and community groups to close gaps in comprehensive data collection of marine related variables in key watersheds identified by the biophysical modeling

Understand To understand origins of long-term natural variation in key physical, chemical, and biological variables in coastal watersheds of the GEM region To understand if proximate human influences are perturbing key physical, chemical, and biological variables beyond the range of natural variation in coastal watersheds of the GEM region

Proposed Actions in FY 05

- Initiate development of watershed component of the GEM biophysical model to advise on sampling strategies for marine related nutrients and food in watersheds In support of GEM watershed modeling, develop, obtain, or identify a readily accessible GIS or web-based database of existing anadromous fish productivity data in the GEM region and determine where there are gaps in the spatial coverage, variables measured, and quality of data

Proposed Actions FY 06 -07

- Implement more detailed modeling and data assimilation experiments Basic statistical and ecosystem modeling of the species and processes involved in the input of marine nutrients and carbon is implemented to refine the concepts of biologically meaningful marine related variables, and to assimilate data to refine the sampling design

Inform Develop a web based system for distributing information and peer reviewed author-attributed data sets from the GEM program

Proposed Actions in FY 04

- Establish web pages for the Watershed habitat and the GEM Model (Cross Habitat activities) on the EVOS web site Web page to contain relevant EVOS publications and reports and other information

Proposed actions in FY 05 – 07

- Hold regular work sessions where researchers of GEM watersheds can collaborate on methods, analysis and modeling efforts

Solve Develop tools, technologies and information that can help resource managers and regulators collect data on key physical, chemical and biological variables in coastal watersheds of the GEM region and improve management of marine resources and address problems that may arise from human activities

Proposed Actions in FY 04 – 07

- Investigate opportunities to improve and/or extend the quality and availability of existing community based data collection projects for key physical, chemical and biological variables in coastal watersheds of the GEM region
- Participate with regional partners in the development of a strategic plan for use and improvements to remote sensing data acquisition, analysis and modeling of coastal watersheds of the GEM region

Proposed Actions in FY 07

- Apply models to begin process of developing watershed management products in cooperation with community groups and management agencies

EVOSTC Watershed-Related Projects

In FY 03, complete Kenai River Watershed planning effort FY 04 initiate research efforts to measure basic marine signals in selected watersheds

- 02612 - Detecting and Understanding Marine-Terrestrial Linkages in a Developing Watershed
Nutrient Cycling in the Kenai River Watershed – A Mazumder A draft Kenai River
Watershed Study Plan has been prepared and is undergoing peer review
- 02649 - Reconstructing Sockeye Populations in the Gulf of Alaska over the Last Several
Thousand Years The Natural Background to Future Changes – B Finney Equipment
failure has delayed completion of the coring until Spring 2003

Non-EVOSTC Projects

Narrative

The monitoring and research efforts of GEM are to be viewed through the complementary data gathering activities, retrospective data sets and models of potential partner agencies in the coastal Gulf of Alaska Persons submitting proposals, reviewing proposals and administering ongoing research and monitoring projects should routinely compare proposed and ongoing activities to the list of Non-EVOSTC projects by agency, as a first step toward the coordination and leveraging goals of GEM for all projects When similar items are found, additional information on the projects is available in databases of GEM and other agencies (CIIMMS, PMEL and PICES) through links on the GEM website or directly from the agencies A brief list of the dominant non-EVOSTC data sources for watersheds in the GEM region follows as an entry point to the larger databases

List by Agency

Cook Inlet Keeper Lower Kenai Peninsula Watershed Health Project

ADF&G - Sonar Enumeration of Returning Adult Salmon

ADF&G - Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes

ADF&G - Weirs and Counting Towers for Enumeration of Returning Adult Salmon,
Escapement

ADF&G - Aerial / Foot Surveys of Spawning Streams, Salmon Escapement

USDOI - Hydrologic Data Collection and Investigations

Offshore

The offshore program for the foreseeable future will consist of observations on plankton, temperature, salinity, and fluorescence collected from ships of opportunity, as described in the Alaska Coastal Current (ACC) habitat The development of the offshore program needs to await further developments of data in the other habitat types and the development of the GEM model

Data Management and Information Transfer

The GEM data management project presents a unique challenge for data systems development When fully implemented, GEM will be a long-term monitoring program annually producing a large array of datasets which need to be incorporated into a system which provides selective accessibility to the data contained within The GEM system must supply users and other data warehouse systems a transparent view of the data outside of the confines of the individual datasets The system must be highly scalable and flexible but still provide structured descriptors

in lookup tables for expediting all inclusive queries. Thematic, semantic and syntactic metadata and geo-referencing must be incorporated as an essential part of the architecture of the system. The system must also act as a robust and concrete data archive to ensure integrity and longevity of the data itself.

The GEM data management system must address the issues related to the data types supplied by the observational component and the demand placed by the applications component. As such, the data management system is positioned between these two components and must develop and maintain an interface to both. In addition, modeling and map creation applications will generate new data that will also be archived and delivered by the GEM data system. More detailed information on data management and information transfer can be found in Chapter 9 of the GEM Program Document.

Primary System Requirements

Flexibility

For the most part, GEM data sets will be non-homogenous, independent, and unique from each other. Datasets could consist of physical measurements, taxonomic measurements, as well as unforeseen types, or combinations of all three. The GEM data system must be able to accommodate foreseen data in addition to allowing for the absorption of unknown data and information types. The system must be able to absorb all GEM data in structured form associated with descriptive syntactic and thematic metadata to allow facilitation of queries.

Scalability

Due to the nature of the GEM project, its data system must be capable of easily absorbing multiple heterogeneous datasets each year. Over the years the number of datasets could rise into the thousands and comprise a data warehouse of a billion or more records. The data system must be inherently scalable and capable of easily absorbing new datasets into the system with minimal required maintenance. Data incorporation must be simple, automatic and straightforward.

Metadata

Data is useless in today's scientific world without its complementary metadata. Syntactic, semantic and thematic metadata must be an integral part of the GEM data system and accessibility to it must exist via simple pathways. Syntactic metadata describes programmatic/computational technical characterization of data and can include, but not be limited to, data type, measurement units and associated measurement error. Semantic metadata can describe contextual information about the individual data and include descriptions like measurement type and measurement device. Thematic metadata can include descriptions which define the context of the study which produced the data and could include information detailing principal investigator, species association, study hypothesis, etc. Information describing the context of the measurement, data collection device, units, and spatial temporal relationships are just a few of the descriptive quantities which must be contained within the system. The metadata must be standardized and structured (i.e., contained in lookup tables chosen for universal usage) to assist in data extraction, data mining and data formatting functionality. Metadata specifications must meet with Federal Government Data Committee (FGDC) requirements.

Transparency, Aggregation and Data Mining

Though the GEM data system will be composed of multiple heterogeneous data sets, users of the system must interface it as if they are accessing a single dataset. The ability to generate subsets of data from both individual and multiple sets is an absolute necessity of the system. This ability to aggregate data from independent datasets into a homogenous representation must be a core property of the system. Projects will of course produce unique datasets. Many measurements of each independent dataset will be of the same semantic type but may very well be represented in differing units and data types. Structures must exist within the data system to isolate those semantic homogeneities and format and aggregate those measurements to produce a continuous transparent view of the distributed data. Users should be able to data mine the system for information which conforms to their search criteria.

Data Interchange between Other Data Warehouse Systems

A paramount requirement of the GEM data system is that it be able to interact, extract and contribute to other data systems. The facilitation of these tasks will be through the use of middleware products which must be inherently compliant with characteristics of the data system. The system should also be capable of interfacing with current oceanographic data sharing protocols such as OPENDAP.

GIS and Web Functionality

The system selected for the storage of GEM related data must be both Web and GIS enabled without the application of extravagant measures to do so. Both of these technologies have become primary sources for the representation and dissemination of modern information, and having a system which is conducive to the creation of ports to these technologies is a fundamental requirement of any contemporary information system.

GEM Data and Metadata Archive System

The GEM data system must act as a robust and concrete data archiving system to insure backup and integrity of the data contained within it. This will include all data, metadata and computational structures.

Current Design

The core of the GEM data system lies in the inherent characteristics of the data and metadata archive system. The archive system is the programmatic structure which holds the actual numeric values contained within the various datasets which are supplied by GEM funded projects. The system is also responsible for organizing this data through the use of inherent metadata system structures into categories and associations which will be useful in providing gateways to the information to future researchers. The archive system is the foundation of the entire GEM data system and, in this sense, requires much care and foresight in its development. The capabilities of the GEM data system will draw upon the functionality imbedded in the archive structure, conversely, intrinsic flaws in the archive structure will be perpetuated on every level of the GEM data system.

The relational database methodology has been chosen as the framework for the development of the foundational archive system because it can provide the functionality requirements of the GEM data system listed above. The methodology for developing data archive structures using the relational design has remained virtually unchanged since its advent in the late 1960s. Many

OBIS, GOOS and IOOS, will be developed to share data using OPENDAP or other middleware products. Although development of these components is projected to occur in FY 05 and beyond, we can ensure a certain level of system functionality with the use of current computer technology. The following is a rough template of basic core functionality components which will be provided by the GEM data system, and is expected to be modified by both user need and future technological innovation.

Web Interface

Data stored in the GEM data system will be available for download over the internet. The internet application will be dynamic in nature and data driven to accommodate issues of scalability. The web interface will accommodate complex query requests and create a friendly intuitive interface for users to process their requests. Query functionality will exist on the individual record level allowing users to create subsets of individual datasets. Downloads will be available in a multitude of formats (i.e., comma delimited, tab delimited, excel spreadsheet, etc.). Downloads will also include a metadata document generated from relevant entries in the relational database. This metadata document will contain the data type, units, sampling device (when relevant) for every field in the dataset download, and any known quantitative errors associated with the sampling device. The document will also contain information specific to the inclusive dataset (i.e., principal investigator, description of project which generated report, table description as documented by PI, field description as documented by PI, and directions on how to find more information on the project itself). The web interface will be written in Cold Fusion and .NET web services.

Spatial/Temporal Geo-Referencing

All data will be spatially and temporally documented as defined by the GEM data policy. This will include latitude, longitude, depth, and time when relevant. The spatial fields will be interfaced through a Geographic Information System (GIS) and indexed appropriately using Spatial Data Engine (SDE) or Oracle Spatial depending upon the backend database platform. Current development is occurring on SQL Server 2000 and would therefore use SDE. A GIS query interface will of course be integrated into the web interface to facilitate spatial query, aggregation, and analysis functions.

ODBC Client Connectivity

Certain users will require direct connectivity to the system via their client side software analysis packages. Users will be able to connect analysis packages such as matlab, arcview, and SPS directly to the database via Ordinary Database Connections (ODBC).

Large Scale System Data Sharing

A critical component of the GEM data system is its ability to communicate, disseminate/ absorb information, and interoperate with other scientific data storage systems. This process will be facilitated through the implementation of OPENDAP and other middleware products.

The following page displays a template for the technological structure of the future GEM data system as it is seen now by the Data Management section.

GEM Data Management and Information Transfer Needs and Schedule

Actions in FY 03

- Define primary system level requirements (staff)
- Initiate development of data archive system (staff)

Proposed Actions in FY 04

- Construct a database of metadata describing marine-related databases from the northern Gulf of Alaska relevant to GEM (project)
- Develop pilot project to apply OBIS within the GEM region (project)
- Finish development and test the GEM data system architecture for primary level functionality (staff)
- Define metadata descriptors for use in defining various current GEM datasets (staff)
- Research technology for higher order data system functionality (staff)

Proposed Actions in FY 05 and beyond

- Isolate secondary and tertiary requirements and ensure that higher order system functionality (i.e., presentation and analysis of data) be incorporated into the growing data system

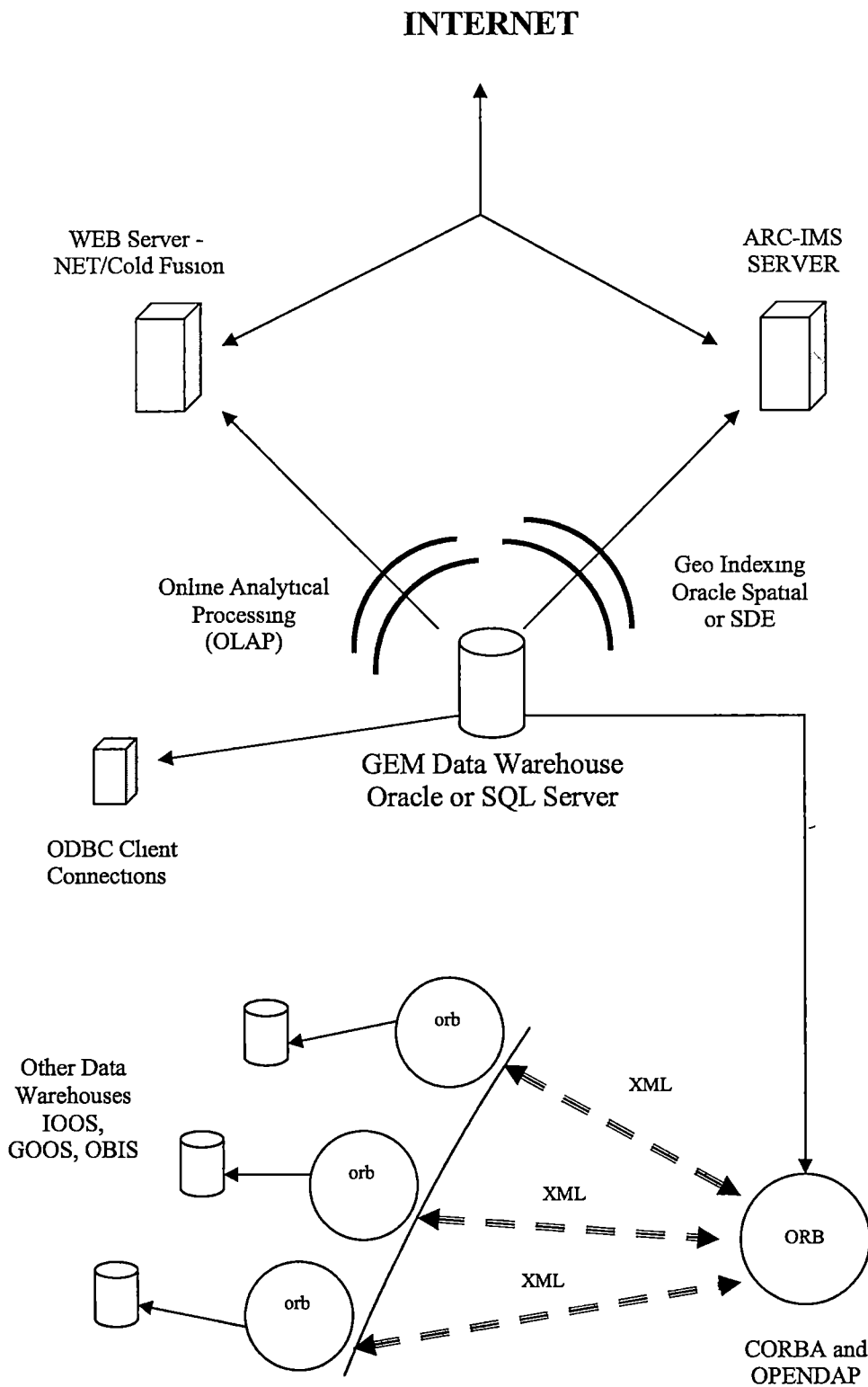


Figure DMIT-2 Technological structure of GEM data system and communication components

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INVITED PROPOSALS BY CATEGORY FOR FFY 04 GULF ECOSYSTEM MONITORING AND RESEARCH PROGRAM

NOTE TO PROPOSERS

Invited Proposals by Category for FY 04 invites proposals in sections that describe the parts of the GEM program under development at this time

- A Synthesis
 - B Data Management and Information Transfer
 - C Modeling
 - D Community Involvement
 - E Lingering Oil Effects
- opportunities in the GEM habitat types targeted for new projects in FY 04
- F Alaska Coastal Current
 - G Nearshore
 - H Watersheds
- projects funded through GEM in FY 03
- I Continuing Projects

Each section has three parts (1) an explanatory introduction that establishes context (definition and uses or objectives), (2) a general description of what is invited, and (3) specific examples of what is invited. References to the GEM Science Plan and GEM Program Document in the text below indicate where further information may be found on the GEM Program (both documents available at <http://www.oilspill.state.ak.us/gem/documents.html>)

Note that few new proposals are invited in the nearshore (intertidal/subtidal) habitat type because it is already under active development with projects initiated in FY 03. New projects in the offshore habitat type await direction from studies yet to be completed by other efforts, such as GLOBEC (see GEM Science Plan) and the Alaska Coastal Current habitat. In addition, new proposals for remote sensing are not invited, but the potential for applying remote sensing to individual projects will be examined through the Trustee Council's review process.

INVITED PROPOSALS

A Synthesis

Definition and Uses of Synthesis within the GEM Program The required scientific guidance for implementing the GEM program is based on putting together ideas, pieces of information from the scientific literature, and the potential relations among existing data gathering programs, including GEM (see Chapter 3 of the GEM Program Document for further information), to form a larger picture. Synthesis is the entry point to the cycle of monitoring and research.

Synthesis builds on past experience to update the current understanding of the northern Gulf of Alaska marine ecosystems. It brings together existing data and information from any number of disciplines, times and regions to evaluate different aspects of the GEM Program's conceptual foundation, central hypotheses and related ideas, working from the perspective of a habitat type. Synthesis has three broad uses. First, it is used to provide direction for developing and refining hypotheses to be tested and, combined with research and monitoring, to update and refine the GEM Science Plan. In this respect, synthesis is an ongoing evaluative process throughout the life of the GEM Program and will help ensure that the program is meeting its goals and objectives. Second, synthesis is intended to produce communication tools such as publications, oral presentations and other media to inform scientists, stakeholders and other members of the public about the developing understanding of the factors responsible for change in the marine environment. Third, synthesis may be used to identify opportunities to solve resource management problems, by showing how to match existing data from GEM and other sources with practical resource management problems.

The primary purposes of the synthesis activities in FY 04 are to (1) fully develop the introduction to the habitat types in the GEM Science Plan and (2) point out options for projects that might be implemented in FY 06 and beyond.

What is Invited Proposals are invited to provide a synthesis of scientific literature and existing data gathering programs to serve as the introduction to the GEM Science Plan sections for three of the four GEM habitat types: Alaska Coastal Current, nearshore and watersheds. Bearing in mind that the boundaries of habitats are not rigidly drawn (Chapter 2, GEM Program Document), proposals should concentrate on one habitat type. However, each proposal must address linkages of its habitat type with the other habitat types. In addition, proposals should demonstrate how the synthesis would proceed from the primary source documents for GEM--the GEM Program Document, the GEM Science Plan, and the National Research Council's GEM review book (*A Century of Ecosystem Science*, 2002), and *Exxon Valdez Oil Spill Restoration Plan - Update on Injured Resources and Services* (August 2002), all found at <http://www.oilspill.state.ak.us/gem/documents.html>--to incorporate scientific literature and data gathering activities not addressed in the source documents. In addition, synthesis documents should incorporate, to the extent they are available, the results of Restoration Program research, as developed in the three-year EVOS Restoration Project /600 (Synthesis of the Ecological Findings from the EVOS Damage Assessment and Restoration Program). Methods should include consultation with EVOS staff and contractors, GEM committees and relevant working groups (if any), state and federal resource agencies and concerned members of the public. At a minimum, the results of the synthesis are to be presented orally at a public meeting and should be suitable for publication as a review article, as well as incorporation into the relevant sections of the GEM Science Plan and the Gulf of Alaska section of a North Pacific Ecosystem Status Report now under development by the North Pacific Science Organization (PICES, see Modeling section of this document).

Examples of Responses to the Synthesis Invitation

- 1 Alaska Coastal Current (ACC) Synthesis The proposed synthesis document(s) would address recent advances in biology and physical sciences relevant to the ACC, discuss

how recent advances might change existing concepts, point out leading and emerging hypotheses and describe how these might support or change the GEM Science Plan's working concepts for the habitat type. It would identify and synthesize major monitoring and research efforts located in the northern Gulf of Alaska, demonstrating a working knowledge of these projects and listing examples, such as FOCI, NDBC moorings, GLOBEC/PMEL moorings and cruises, OCC cruises, and NASA/NESDIS remote sensing. It would point out how these information types may relate to GEM Science Plan working concepts and selection of GEM monitoring projects and the GEM contribution to a Gulf of Alaska section in a North Pacific Ecosystem Status Report now under development by PICES. Possible linkages of the ACC to the nearshore, offshore, and watershed habitat types based on recent and historical literature would be examined. It would identify and prioritize gaps in knowledge relative to the GEM Science Plan's working concepts. Methods would include consultation with appropriate parties identified in the above section, as well as substantial coordination and cooperation with existing GEM ACC projects. Amount of proposals should be in vicinity of \$60,000 per year, and proposals may cover up to three years of work.

2. **Nearshore (Intertidal/Subtidal) Synthesis** Recognizing that substantial synthesis work in relation to GEM has already been accomplished for the nearshore, a proposed synthesis document would build on the GEM Science Plan and the design work of Schoch, et al (2002, see GEM Science Plan) to address recent advances in biology and physical sciences relevant to the nearshore and point to the opportunities and needs for establishing a geographically distributed network of monitoring sites during FY 06. In addition, the synthesis would discuss how recent advances in scientific knowledge might relate to existing concepts, point out leading and emerging hypotheses, and describe how these might support or change the GEM Science Plan's working concepts for the habitat type. It would identify and synthesize major monitoring and research efforts located in the nearshore habitat types, such as the monitoring sites of Kachemak Bay National Estuarine Research Reserve, Prince William Sound and Cook Inlet Regional Citizens' Advisory Councils, Alaska Department of Environmental Conservation's Environmental Monitoring and Assessment Program/Southcentral Alaska Coastal Survey, and the Mussel Watch program. Building on results from GEM Project 030687 (Nearshore Decision Process), it would point out how existing and emerging information types may relate to GEM Science Plan working concepts, selection of GEM monitoring projects, and the GEM contribution to a Gulf of Alaska section in a North Pacific Ecosystem Status Report now under development by PICES. It would identify and prioritize gaps in knowledge relative to the GEM Science Plan's working concepts. Methods would include consultation with appropriate parties identified above, as well as substantial coordination and cooperation with existing GEM nearshore projects. Amount of proposals should be in vicinity of \$60,000 per year, and proposals may cover up to three years of work.
3. **Watershed Synthesis** Recognizing that substantial work toward synthesis needs to be accomplished for the watershed habitat type, a proposed synthesis document would build on the watershed sections of the GEM Science Plan and GEM Program Document to incorporate recent advances in biology and physical sciences. It would address opportunities and needs for establishing watershed monitoring sites during FY 06. In

addition, the synthesis document would discuss how recent advances in scientific knowledge might relate to existing concepts, point out leading and emerging hypotheses, and describe how these might support or change the GEM Science Plan's working concepts for the habitat type. The document would identify and synthesize major monitoring and research efforts located in the watershed habitat type, including work undertaken or funded by state and federal resource agencies, tribes and native corporations. Building on results from GEM Project 02612 (Kenai River Watershed), it would point out how existing and emerging information types might relate to GEM Science Plan working concepts, selection of GEM monitoring projects, and the GEM contribution to a Gulf of Alaska section in a North Pacific Ecosystem Status Report now under development by PICES. It would identify and prioritize gaps in knowledge relative to the GEM Science Plan's working concepts. Methods would include consultation with appropriate parties identified above, as well as substantial coordination and cooperation with existing GEM nearshore (intertidal/subtidal) projects. Amount of proposals should be in vicinity of \$60,000 per year, and proposals may cover up to three years of work.

B Data Management and Information Transfer

Definition and Uses of Data Management and Information Transfer within the GEM Program

The Data Management and Information Transfer component of GEM includes the following functions: data receipt, quality control (QC), storage and maintenance, archiving and retrieval, administrative support, and the systems necessary to automate as many of these procedures as possible. This component also includes programs needed to create the custom data and information products that will be provided to the modeling and applications components, and to the users of this information. Data Management and Information Transfer provides the essential function of extracting the full scientific and societal benefits from GEM projects (NRC 2002, GEM Program Document, Chapter 9).

Data generated by GEM projects need to be converted into useful information that is readily available in a timely fashion to the scientific communities, resource managers, resource dependent people and their communities, policy makers, and other members of the public. In addition, data sets and information regarding other research and monitoring activities in the GEM region must be readily accessible to EVOS staff and contractors, GEM committees and working groups (if any), state and federal resource agencies, and concerned members of the public in order to facilitate gap analysis during project selection and implementation, and maximize the use of all data collected (GEM Program Document, Chapter 3).

What is Invited Proposals are invited to construct a database of metadata describing marine-related databases from the northern Gulf of Alaska relevant to GEM. Working from past and present efforts of GEM, PICES, NPRB, UAF/IMS, PMEL and others, projects would compile a list of databases related to the physical and biological features of the northern Gulf of Alaska and assess and analyze their potential relevance to GEM. Meta descriptions of existing datasets would include thematic and semantic descriptors (i.e., study context such as PI, funding source and locality, species study association, listing of physical/biological measurements performed by study, and quantity and quality of measurements performed). In addition, a syntactic metadata description will be required which would include, but may not be limited to, file format, file size,

and storage mechanism and location. The successful proposal would create a comprehensive, web accessible georeferenced database of the marine-related physical and biological databases of the northern Gulf of Alaska, building on standards and systems already in place, such as the State of Alaska's Cooperatively Implemented Information Management System (CIIMMS) and the STORET database. The successful proposal would describe an approach that assigns priorities for inclusion of databases based on a combination of factors such as length of time series, use in existing physical or biological models, and relevance to GEM. PIs of the successful proposal will be expected to work with GEM staff to create a list of predefined criteria which assigns a quantitative value summarizing the importance of the dataset to specific GEM efforts. Cost efficiencies through cooperation, coordination, and integration with similar efforts covering related geographic areas are expected. Ways and means of insuring close coordination with GEM modeling efforts should be described. Essential requirements are ease of web access and export of information to other systems. Consult GEM Program Document Chapters 8 and 9 and NRC Chapter 7 for further background.

Examples of Responses to the Data Management and Information Transfer Invitation

1. **Adaptation of Existing Metadatabase.** The proposal would adapt for GEM purposes the North Pacific marine metadatabase now under development through the North Pacific Research Board. The proposal would show how to filter existing metadata to make them specific to the GEM region, habitat types, and subject areas defined by the working concepts of the GEM Science Plan. The methods would provide for annual filtering and distribution to GEM users. Annual amount of proposal should be in vicinity of \$75,000-\$90,000. One year of funding is anticipated. However, proposals for annual or other periodic updating may be invited in FY 05.
2. **Pilot Project to Apply Ocean Biological Information System (OBIS) within the GEM Region.** The proposal would show how to set up a regional OBIS node by deploying an instance of the OBIS database structure. In addition, the proposal would create a plan to facilitate the absorption into the regional OBIS node of past, present and future marine taxonomic data collection efforts. Information on OBIS can be accessed via the web at <http://marine.rutgers.edu/OBIS/>. Working with a resource management agency, the proposal would identify a manageable data and information system to host the pilot demonstration and provide an implementation schedule and plan for the OBIS software. A successful proposal would define a method to isolate candidate historic datasets which have characteristics which lend themselves to be easily absorbed into the OBIS database structure. Preference should be given to datasets that span multiple agencies. The data system chosen for the pilot project is expected to have scientific relevance to themes presented in the GEM Program Document and GEM Science Plan. Annual amount of proposal should be in vicinity of \$60,000. One year of funding is anticipated. However, proposals for annual or other periodic updating may be invited in FY 05.

C Modeling

Definition and Uses of Modeling within the GEM Program One of the top overall priorities for the GEM Program is to develop a whole-ecosystem natural resource model as an adaptive management tool for guiding the GEM monitoring program (see GEM Program Document,

Chapter 8, and NRC 2002, Chapter 7) An interdisciplinary biophysical modeling effort is essential to developing monitoring efforts in all of the habitat types, as well as the data management and information transfer component of the program Modeling helps to understand the limitations on what can be learned from sampling in different time and space scales through simulations based on data from the projects The ultimate long-term purpose of the model is to describe, in relation to biological and physical variables, the abundance through time of seabird, marine mammal and fish species that are selected for relevance to management interests Modeling is also used to identify and refine measures, such as time series of biological or physical measurements that are best suited to communicate publicly the current status of the ecosystem for the GEM contribution to a Gulf of Alaska section in a North Pacific Ecosystem Status Report now under development by PICES and others

What is Invited Proposals are invited that address how an interdisciplinary biophysical model of the northern Gulf of Alaska would be developed in the short-term As envisioned, building the model would start from existing physical and biological models, hence, the means of cooperation, coordination, integration, and achieving cost efficiencies with existing modeling efforts must be emphasized in a successful proposal Ways and means of communicating the contents, functions and outputs from the model to a variety of different disciplines and across a variety of common operating systems should also be carefully described, as well as data assimilation strategies for selecting time and space scales for biological and physical monitoring

Examples of Responses to the Modeling Invitation

- 1 Building the Infrastructure Necessary to Create, Develop and Maintain the GEM Model The proposal would assemble an interdisciplinary team with experience in biological and physical modeling in the Gulf of Alaska Team members should have experience in, or knowledge of, existing biological and physical modeling programs, such as SEA, FOCI and GLOBEC Methods would address all aspects of interdisciplinary cooperation and partnerships, software development, hardware acquisition, use of existing products, and data management and information transfer with respect to all GEM projects and activities, as well as other relevant data acquisition activities Annual amount of proposal should be in vicinity of \$100,000 Three years of funding should be proposed, as the initiation of a long-term GEM activity
- 2 Implementation of Components of the GEM Model The proposal would describe a one-year planning effort to develop a plan for implementing one of the smaller, but critical, components of the GEM model, such as the SEA (Restoration Project /320) pink salmon survival model, over a three-year period starting in Spring 2005 The proposal would show how to address all aspects including assembling an interdisciplinary team of implementers, staging and scheduling field sampling, estimating parameters from data, acquiring and developing essential software and hardware, and data management and information transfer A one year proposal in vicinity of \$70,000 is expected A follow-on proposal for implementation of the three-year plan may be invited during FY 05 depending on the outcome of the planning effort

D Community Involvement

Definition and Uses of Community Involvement within the GEM Program Meaningful public and community participation has long been an essential part of the Trustee Council's process and an essential strategy for implementing the GEM Program (GEM Program Document, Chapters 1 and 3, NRC 2002) Current and future GEM monitoring projects are encouraged to have a strong community involvement component whenever possible Comprehensive strategies for incorporating community involvement in GEM projects are being developed now under GEM Project 030575 (GEM Program Community Involvement/Community-Based Monitoring Plan) for the Council's consideration in the fall of 2003 Until that plan is developed, reviewed, and adopted by the Council, no new specific community involvement projects are being solicited with the exception noted below

What is Invited Proposals are invited to develop specific products such as targeted workshops, databases, maps, publications, and community science symposia that provide services to communities and stakeholders in the GEM region related to marine ecosystem health and sustainability Proposals will be evaluated on their relevance to community needs, potential to develop community resources of potential use to other GEM projects, and their link to the goals of the GEM Program

Examples of Responses to the Community Involvement Invitation

- 1 Science Symposium for Smaller Communities Proposal would develop a small-scale scientific symposium for coastal communities to serve those who are not able to travel to Anchorage for the annual EVOS-sponsored symposia Annual amount should be in vicinity of \$10,000-20,000
- 2 Coastal Mapping Proposal would produce GIS maps of resources for specific coastal communities, building on mapping efforts already completed and underway by organizations such as NOAA, the Cook Inlet Regional Citizens' Advisory Council, Alyeska Pipeline Service Co, and others Annual amount should be in vicinity of \$10,000-20,000

E Lingering Oil Effects

Objectives for Lingering Oil Effects in FY 04 The Trustee Council continues to be concerned about *Exxon Valdez* oil remaining in the marine environment and any effects it may be having on injured resources Injured resources are identified and their current status described on the Trustee Council's web site at <http://www.oilspill.state.ak.us/facts/status.html> Current objectives for the Lingering Oil Effects component of the Council's program are focused on examining the fate and effects of the remaining oil on injured resources and services and especially populations of two species in western Prince William Sound, harlequin ducks and sea otters These populations have shown continuing exposure to hydrocarbons in localities where potentially toxic forms of oil from the *Exxon Valdez* are known to persist Objectives for FY 04 also include learning about the status of subsistence uses of the injured resources in the spill affected areas for comparison to an earlier survey in 1998

The reasons that some populations of injured species in Prince William Sound have not met the criteria established for their recovery in the nearly 14 years since the oil spill are still not clear. For some species it has not been possible to clearly separate the possible toxic effects of oiling from the possible effects of natural causes such as climate change and predation. For this reason, GEM projects that address injured species and ecosystems are designed to understand the effects of natural forces on populations and their productivity. The knowledge gained may permit at least a retrospective understanding of oil injury versus other impacts for species injured by *Exxon Valdez* oil, and provide the background on natural forces necessary to understand effects of oiling in future oil spills.

What is Invited Proposals are invited to examine the fate and effects of *Exxon Valdez* oil in western Prince William Sound. Proposals specifically addressing these effects on populations of sea otters and harlequin ducks are of interest. Proposals are also requested to examine the status of subsistence activities in the spill affected areas. In addition to the objectives and examples described here, proposers may use this invitation to suggest other approaches to aid the recovery of other resources and services that were identified by the Trustee Council as having been injured by the oil spill. However, the Trustee Council's emphasis in FY 04 will be on development of the GEM Program as its primary restoration activity.

Examples of Responses to the Lingering Oil Effects Invitation

- 1 Bioavailability of Lingering Oil in Prince William Sound Research conducted in Prince William Sound in 2001 estimated that about 28 acres of intertidal beach remain contaminated from spilled *Exxon Valdez* oil. The Trustee Council is interested in evaluating the bioavailability of this oil to sea otters and harlequin ducks in the Prince William Sound area. Proposals are invited to evaluate foraging activities of sea otters in oiled areas, collect sea otter mortality, emigration and population data, and monitor harlequin duck recovery. Annual amount of combined proposals should be in vicinity of \$150,000. One year of funding is anticipated.
- 2 Monitoring of Presence of Lingering Oil The Trustee Council is interested in establishing a strategy for monitoring persistence of *Exxon Valdez* oil, and its relationship to other sources of contamination in Prince William Sound. Annual amount of proposal should be in vicinity of \$40,000. One year of funding is anticipated.
- 3 Subsistence Uses in Spill Affected Areas The last complete survey of the status of subsistence uses in spill-impacted communities was conducted in 1998. FY 04 is six years later, and the Trustee Council will consider proposals to evaluate the status of subsistence uses by collecting, analyzing, and reporting information about current subsistence uses in a subset of oil spill area communities using methodology that is comparable with previous research results. The evaluation should be a collaborative effort in which the study communities are partners in each phase of the study. Annual amount of proposal should be in vicinity of \$300,000. One year of funding is anticipated.

F Alaska Coastal Current (ACC)

Objectives for ACC in FY 04 The top priority for GEM in the ACC starting in FY 04 is to initiate the process that leads to collecting basic physical (temperature and salinity) and biological observations (optical measures, such as fluorescence) from a vessel of the Alaska Marine Highway System (AMHS) or other ship of opportunity operating in the waters of Prince William Sound, outer Kenai Peninsula, lower Cook Inlet, Kodiak and the Alaska Peninsula. Observations on these basic variables will be of use to a range of scientists, resource managers, and public members for multiple purposes and are fundamental to the future GEM modeling program. As part of this objective, continued development of the vessel-of-opportunity projects deploying the continuous plankton recorder and thermosalinograph into long-term projects is desirable. Another priority is to begin applying monitoring results to management of development activities in the ACC.

What is Invited Proposals are invited to investigate and describe a time-sequenced approach that would be implemented over three years to establish a Voluntary Observing Ship data acquisition program based in the northern Gulf of Alaska. The Alaska Marine Highway System (AMHS) would be a likely candidate for this effort. The first step would be to explore and present the options on routes, choices of variables (temperature, salinity, etc.) in relation to capabilities of current instruments, sampling frequencies, data management and information transfer, and incremental costs for each of these activities. The design should envision adding instruments to monitor other variables in the future, as needs for them are identified by the GEM process. Capitalizing on existing community assets, such as scientists and interested lay people in the communities served by the ferries or other possible vessels, is an important consideration in system design. In addition, capitalizing on existing scientific assets on the AMHS, such as the U.S. Forest Service interpretive program, is highly desirable.

The second step in the sequence would be to explore installing equipment on the seawater intake system of a vessel operating in the waters of the northern Gulf of Alaska to record temperature, salinity and fluorescence at known times from an estimated average depth. If the AMHS appears to be appropriate, the successful proposal would address in detail all aspects of the deployment, including contact and relations with the AMHS administration, vessel master and crew, the selection, installation, testing and maintenance of equipment, the data process including acquisition, retrieval, quality control and assurance, and transmittal to GEM, and development of community-based support for logistics. Proposers should demonstrate knowledge of other ferry box and VOS data acquisition systems in the U.S., Europe and Japan, and of published coordination and cooperation efforts within the PICES MONITOR Task Team. Consult GEM Program Document, Chapter 9. *Note: Proposers wishing information from the Alaska Marine Highway System should first contact Phil Mundy, EVOS Science Director (phil_mundy@oilspill.state.ak.us), for referral to the appropriate authority at AMHS.*

Proposals are also invited to analyze the information needed to support resource and environmental management decisions for human activities in the ACC.

Examples of Responses to the ACC Invitation

- 1 Collecting Physical and Biological Observations from the Alaska Marine Highway System (AMHS) The proposal would offer to assemble a team of experts capable of planning and implementing an observing system that takes underway measurements relevant to the GEM model (e g , salinity, temperature and optical measures) from AMHS ferries Over a three-year period, the proposal would develop the feasibility of installing specific instruments to collect temperature, salinity and optical measures of primary productivity on AMHS vessels and present those options (year one), initiate a pilot project (year two), and develop a fully operational real-time data acquisition and delivery program (year three) Community involvement in port areas is expected Annual amount of first year should be in vicinity of \$100,000, with subsequent years' levels of funding dependent on findings during the first year A one-year proposal should be submitted with the understanding that consideration for subsequent years of funding would be dependent on findings and performance during year one *Note Proposers wishing information from the Alaska Marine Highway System should first contact Phil Mundy, EVOS Science Director (phil_mundy@oilspill.state.ak.us), for referral to the appropriate authority at AMHS*
- 2 Collecting Physical and Biological Observations from Non-AMHS Ships-of-Opportunity The proposal would continue the current GEM ship-of-opportunity activities that deploy the continuous plankton recorder, thermosalinograph and fluorometer on tanker vessels and provide a three-year plan for making them into an operational monitoring program for the ACC and offshore habitat types Community involvement in port areas is expected to continue, and the possibility of partnerships with NPRB should be explored Annual amount should be in vicinity of \$130,000 Three-year proposals should be submitted
- 3 Identify the Potential Mechanisms and Approaches for Monitoring Currents in Prince William Sound Building on the results of the SEA project (Restoration Project /320), the proposal would identify the potential mechanisms for understanding current flows into and out of Prince William Sound for the ultimate purpose of contributing physical data to models of the relationships between currents and productivity The proposal should assemble a team of scientists capable of designing and implementing a solution, provide an overview of data collection activities currently underway and being planned in Prince William Sound (with particular emphasis on Hinchinbrook Entrance and Montague Strait), identify variables needed to understand currents in relation to productivity, and develop a complete plan for implementing an observing program in collaboration and cooperation with other ongoing efforts Annual amount should be in vicinity of \$75,000 A one-year proposal is expected However, consideration for subsequent years of funding would be dependent on findings and performance during year one
- 4 Applications of Monitoring to Management of Human Activities in the Alaska Coastal Current Building on the GEM Program Document (see especially Chapter 7 14-15), the proposal would analyze the information needed to support resource and environmental management decisions for a range of human activities (oil and gas development, seafood

processing, tourism and recreation, etc) in the ACC in one of the major geographic regions of the GEM area (Prince William Sound, Cook Inlet or Kodiak-Afognak) Working in close cooperation with state and federal agencies actively engaged in resource and environmental management activities and reviewing the current scientific literature, the analysis would identify gaps by comparing information needed by managers to that actually available The analysis would address all aspects of the suitability of past, current and future data and information products needed to support resource and environmental management decisions Annual amount should be in vicinity of \$80,000 Up to three years of funding may be proposed

G *Nearshore*

Objectives for Nearshore in FY 04 Most of the objectives for the nearshore in FY 04 will be met by projects underway in FY 03 However, another objective is to begin applying monitoring results to management of human activities in the nearshore

What is Invited Proposals are invited to analyze the information needed to support resource and environmental management decisions for human activities in the nearshore

Examples of Responses to the Nearshore Invitation

- 1 Applications of Monitoring to Management of Human Activities in the Nearshore Building on the GEM Program Document (see especially Chapter 7 14-15), the proposal would analyze the information needed to support resource and environmental management decisions for a range of human activities (oil and gas development, seafood processing, tourism and recreation, etc) in the nearshore in one of the major geographic regions of the GEM area (Prince William Sound, Cook Inlet or Kodiak-Afognak) Working in close cooperation with state and federal agencies actively engaged in resource and environmental management activities and reviewing the current scientific literature, the analysis would identify gaps by comparing information needed by managers to that actually available The analysis would address all aspects of the suitability of past, current and future data and information products needed to support resource and environmental management decisions Annual amount should be in vicinity of \$80,000 Up to three years of funding may be proposed

H *Watersheds*

Objectives for Watersheds in FY 04 The primary objective for watersheds in FY 04 is to begin learning how to measure marine effects in watersheds In including the watersheds as part of a marine monitoring program, the Trustee Council recognized that marine ecosystems do not stop at the shoreline or other arbitrary geographic boundaries Measuring marine-related phenomena in watersheds, as well as terrestrial-related phenomena in the nearshore, is fundamental to the GEM monitoring program in these two habitat types Even though all available evidence supports the concept that freshwater food webs in anadromous watersheds in the northern Gulf of Alaska and elsewhere are likely to be dependent to some extent on inputs of marine derived

nutrients, there are no systematic monitoring programs for them in the GEM region and very few observations in total

What is Invited Proposals are invited to identify and show how and where to measure the best indicators of marine-related biological production in watersheds, including within an existing water quality monitoring program. The proposal would address and discuss available approaches to measuring marine-related responses of biological production, such as marine isotopes of the elements carbon, nitrogen and sulfur. The proposal would explore the degree to which such isotopic elements would be useful as indicators of marine linkages and their possible variation in various types of watersheds. The proposal would also address possible proxy indicators of isotopes, such as nitrates and ammonium, as well as other possible suitable proxies for marine-related indicators. Essential auxiliary information, such as escapement estimates of anadromous species and seasonal runoff, should be identified. Key questions in sampling should be explored, such as, "What is the variability of marine-related indicators in bodily tissues among species within watersheds? Which species or species guilds are best suited to measuring marine linkages? How do suitable species vary among contrasting types of watersheds (e.g., heavily forested vs. recently glaciated, anadromous vs. non-anadromous, and heavy human development vs. pristine)? Is there an existing water quality sampling program that could be adapted to include monitoring of marine related variables?"

Examples of Responses to the Watershed Invitation

- 1 Detection of Marine-Related Indicators The proposal would describe a three-year program to identify, evaluate and implement statistically rigorous sampling strategies for detecting marine signals from plants and animals in the marine watersheds and nearby nearshore areas. The successful proposal would show how to establish the degree of annual variation in levels of the carbon, nitrogen and sulfur isotopes common in the marine environment, as measured in the tissues of plants and animals in watersheds. A statistical sampling strategy leading to establishment of monitoring stations capable of detecting annual changes in marine-related variables over a period of years would be described. Annual amount should be in vicinity of \$150,000. A three-year proposal is expected with annual renewal dependent on performance.
- 2 Community Based Sampling Strategies for Sampling Marine-Related Indicators The proposal would describe a three-year program to identify, evaluate and implement cost effective, statistically defensible community based sampling strategies for monitoring marine-related variables in watersheds and nearby nearshore areas. The successful proposal would incorporate proven approaches to community based monitoring of the aquatic environment, including QA/QC of citizen monitoring data. It would also show how to establish the degree of annual variation in levels of the isotopes of carbon, nitrogen and sulfur common in the marine environment, as measured in the tissues of plants and animals in watersheds. Annual amount should be in vicinity of \$100,000. Proposals for up to three years may be considered with annual renewal dependent on performance.
- 3 Including Marine Related Variables in an Existing Water Quality Monitoring Program The project would demonstrate how to leverage GEM funding in the water quality area.

by adapting an existing water quality sampling program now used for monitoring the effects of human activities to address GEM questions regarding marine related substances in watersheds (or terrestrial related substances in estuaries/nearshore) The project would work with managers of the existing program and GEM staff to demonstrate how to obtain the required environmental monitoring information for both programs at lower cost than would otherwise be possible by working individually Demonstration must include maintenance of quality control and assurances and the existing management applications of the data Annual amount should be in vicinity of \$50,000 Up to three years of funding may be proposed

I Continuing Projects

Beginning with the FY 04 funding cycle, the Trustee Council is expected to approve projects for multiple years (up to three years duration) The following FY 03 projects proposed multiple-year timeframes, but were funded in FY 03 prior to adoption of the multiple-year policy and hence for one year only Proposals and budgets for the remaining years of these projects (up to three years total) must be submitted in response to this invitation in order to be considered for continued funding If you have any questions regarding the submission requirements, please contact the Trustee Council Office Please note that the Council is not obligated to continue funding for these projects A decision to continue funding will be based on review of the project in accordance with the review criteria described elsewhere in this invitation

030012	Photographic Monitoring of Resident Killer Whales
030052	Tribal Natural Resource Stewardship and Meaningful Tribal Involvement in GEM
030210	Youth Area Watch (Prince William Sound/Lower Cook Inlet)
030290	Hydrocarbon Database
030340	Toward Long-Term Oceanographic Monitoring of the Gulf of Alaska Ecosystem
030600	Synthesis of the Ecological Findings from the EVOS Damage Assessment and Restoration Programs
030610	Youth Area Watch (Kodiak)
030620	Lingering Oil and Predators Pathways of Exposure and Population Status
030635	Trophic Dynamics of Intertidal Soft-sediment Communities Interaction between Bottom-up and Top-down Processes
030647	Investigating Relative Roles of Natural and Shoreline Harvest in Altering Kenai Peninsula's Rocky Intertidal
030649	Reconstructing Sockeye Populations in the Gulf of Alaska over the Last Several Thousand Years
030654	Surface Nutrients over the Shelf and Basin in Summer Bottom-up Control of Ecosystem Diversity
030666	Alaska Natural Geography in Shore Areas Initial Field Project for Census of Marine Life
030670	Monitoring Dynamics of ACC and Development of Applications for Management of Cook Inlet Salmon

Gulf of Alaska Ecosystem Monitoring and Research Program

Work Plan

FY 2004

September 24, 2003



Exxon Valdez Oil Spill Trustee Council
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Notes to Reader

The draft work plan is for consideration for adoption by the Trustee Council. It has been prepared in consideration of all comments received as of September 24, 2003. It contains a complete summary of the record of the decision for each draft recommendation.

Please note that the abstracts in Appendix A were written by the authors of the proposals to describe their projects. To the extent that the abstracts express opinions about the status of injured resources or priorities for the GEM program, they do not represent the views of the Executive Director, the Science Director, or other staff of the *Exxon Valdez* Oil Spill Trustee Council, nor do they reflect policies or positions of the Trustee Council.

There are four categories of recommendations: Fund, fund contingent, defer, and do not fund. The first three categories have been determined to meet near-term needs identified by the Trustee Council, while the “do not fund” recommendation indicates that the proposal would not provide for near-term needs. Funding recommendation categories are defined as follows: 1) **Fund** Proposal meets important near-term needs identified by the Trustee Council and it is clearly ready to move forward. 2) **Fund contingent** Proposal meets important near-term needs identified by the Trustee Council but it has easily resolvable deficiencies in content or some project personnel have overdue reports, so that it cannot move forward until the contingencies have been removed. 3) **Defer** Proposal meets near-term needs identified by the Trustee Council but project has a lower priority than projects in the fund and fund contingent category, or it may have substantial deficiencies in content, or some project personnel have overdue reports, or some combination of these, so that it may not be possible to move forward in the current funding cycle. 4) **Do not fund** Proposal does not meet near-term needs identified by the Trustee Council, or the needs identified are not appropriate at this time, or deficiencies in content cannot be readily resolved, or some combination of these circumstances exist, so that it is not possible to move forward in the current funding cycle.

Full scientific references for the literature cited may be found in the GEM Program document on the Trustee Council’s web site (see reference above), as they are not included here for the sake of brevity.

Executive Summary

Total FY 2004 amount recommended for October 3, 2003 action \$ 3,191,714

Total FY 2004 amount so far approved by Trustee Council \$ 1,572,600

Total FY 2004 amount approved and recommended	\$ 4,764,314
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Total FY 2005 amount recommended **\$ 1,678,442**

Total FY 2006 amount recommended **\$ 1,504,099**

Total FY 2004 – 2006 recommended	\$ 6,374,255
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Total amount deferred FY 2004 \$ 1,339,434

Total amount deferred FY 2005 \$ 665,942

Total amount deferred FY 2006 \$ 778,965

Total FY 2004 – 2006 deferred \$ 2,784,341

<i>Summary</i>	<i>FY 04</i>	<i>FY 05</i>	<i>FY 06</i>
Funding Authorized + Fund + Fund Contingent	\$4,764,314	\$1,678,442	\$1,504,099
Funding Authorized + Fund + Fund Contingent + Defer	\$6,103,748	\$2,457,407	\$2,170,041

This Work Plan draft describes 34 projects in the amount of \$3.192 million for FY 2004, \$1.678 million for FY 2005, and \$1.504 million for FY 2006, for a total of **\$ 6,374,255 for FY 2004 – 2006** for which the Trustee Council is asked to authorize funding at its meeting of October 3, 2003. In addition, the draft Work Plan describes 14 projects in the amount of \$1.339 million for FY 2004, \$0.779 million for FY 2005, and \$0.666 million for FY 2006, for a total of **\$2.784 million for FY 2004 – 2006** for which the Trustee Council is asked to defer action until later in FY 2004. Finally the Work Plan presents an additional 14 projects for which the Trustee Council is advised to deny funding.

Of the 34 projects recommended for funding, 33 are peer reviewed proposals and one is an EVOSTC staff-originated proposal in the amount of \$140K for funding of program managers within individual Trustee Council agencies that was inadvertently omitted from the funding package considered on September 3, 2003. Four staff-originated proposals

that were approved by the Trustee Council on September 3 bring *the total number of all projects in FY 2004 to 38 in the amount of \$4.764 million.*

Executive Summary Table of Proposals received for consideration to start in FY 2004, the amounts recommended for funding in fiscal years FY 2004 – 2006, and the Executive Director's recommendation.

Listing	FY04	FY05	FY06	Rec
Adams-FY04-Fisheries Management	\$46,760.00	\$0.00	\$0.00	Fund
Baird-FY04-Shoreline Habitat Mapping and Community-Based Monitoring	\$20,100.00	\$19,900.00	\$0.00	Fund
Batten-FY04-CPR data	\$135,200.00	\$135,200.00	\$135,200.00	Fund
Bechtol-FY04-Parameters in the N. Gulf of AK	\$50,900.00	\$54,000.00	\$56,000.00	Fund
Bishop-FY04-Top-down and Bottom-up Processes	\$149,529.00	\$164,030.00	\$151,390.00	Fund
Bodkin-FY04-Nearshore Monitoring Decision Process	\$10,000.00	\$0.00	\$0.00	Fund
Cokelet-FY04-AK Marine Highway System Ferries	\$171,500.00	\$185,900.00	\$145,900.00	Fund
Cooper-FY04-Community-Based Sampling	\$102,512.00	\$85,958.00	\$96,942.00	Fund
Eckert-FY04-Natural Variability in the Nearshore	\$36,300.00	\$17,500.00	\$0.00	Fund
EVOS TC-FY04-Project Management	\$140,000.00	\$0.00	\$0.00	Fund
Fall-FY04-Status of Subsistence Uses	\$298,700.00	\$25,600.00	\$0.00	Fund
Finney-FY04-Marine-terrestrial Linkages	\$79,197.00	\$80,154.00	\$81,117.00	Fund
Honnold-FY04-Marine-derived Nutrients on Sockeye Salmon	\$83,200.00	\$82,400.00	\$86,800.00	Fund
Irons-FY04-Bird Abundance in PWS	\$175,518.00	\$0.00	\$0.00	Fund
Kiefer-FY04-Alaskan Groundfish Feeding Ecology	\$80,900.00	\$0.00	\$0.00	Fund
Knudsen-FY04-Nutrient-Based Resource Management	\$173,216.00	\$157,002.00	\$152,632.00	Fund
Konar-FY04-Natural Geography in Shore Areas	\$248,729.00	\$0.00	\$0.00	Fund
Macklin-FY04-NGOA Metadatabase	\$100,600.00	\$0.00	\$0.00	Fund
McNutt-FY04-GEM Infrastructure - Lyn McNut	\$80,835.00	\$80,713.00	\$83,271.00	Fund
Nelson-FY04-Hydrocarbon Database	\$22,200.00	\$22,200.00	\$22,200.00	Fund
Okkonen-FY04-Monitoring Program in the NE Pacific Ocean	\$27,289.00	\$30,366.00	\$31,455.00	Fund
Ruesink-FY04-Altering the Community Structure	\$81,600.00	\$0.00	\$0.00	Fund
Saupe-FY04-Habitat Web Site	\$21,100.00	\$0.00	\$0.00	Fund
Schneider-FY04-Kodiak Archipelago	\$63,000.00	\$63,000.00	\$63,000.00	Fund
Schumacher-FY04-GEM Infrastructure	\$22,067.00	\$23,645.00	\$22,067.00	Fund
Stabeno-FY04-Bottom Control	\$49,500.00	\$0.00	\$0.00	Fund
Thorne-FY04-Seafood Waste Discharge	\$72,680.00	\$111,692.00	\$108,943.00	Fund
Walker-FY04-Marine Derived Nutrients	\$150,200.00	\$153,400.00	\$149,700.00	Fund
Weingartner-FY04-Alaska Coastal Current	\$75,482.00	\$75,482.00	\$75,482.00	Fund
Willette-FY04-Monitoring ACC Dynamics	\$89,800.00	\$68,000.00	\$27,900.00	Fund
Total	\$2,858,614.00	\$1,636,142.00	\$1,489,999.00	
Heintz-FY04-Energy Allocation	\$48,400.00	\$42,300.00	\$14,100.00	Fund Contingent
Rosenberg-FY04-Harlequin Duck Population	\$37,100.00	\$0.00	\$0.00	Fund Contingent
Short-FY04-Monitoring Exxon Valdez Oil & PWS	\$45,900.00	\$0.00	\$0.00	Fund Contingent
Spies-FY04-EVOS Damage Assessment & Restoration	\$201,700.00	\$0.00	\$0.00	Fund Contingent
Total	\$333,100.00	\$42,300.00	\$14,100.00	

Listing	FY04	FY05	FY06	Rec
Bird-FY04-Mobile Data Network-Vessels	\$140,900.00	\$129,200.00	\$130,700.00	Defer Funding
Bodkin-FY04-Lingering Oil and Sea Otters	\$134,300.00	\$26,200.00	\$6,500.00	Defer Funding
Brown-Schwalenberg-FY04-Subsistence & Stewardship Gathering	\$31,250.00	\$0.00	\$0.00	Defer Funding
Couvillion-FY04-Coordinated Coastal Mapping	\$98,500.00	\$0.00	\$0.00	Defer Funding
DeLorenzo-FY04-Youth Area Watch	\$121,100.00	\$126,400.00	\$133,200.00	Defer Funding
Devens-FY04-PWSRCACEVOS long term program	\$141,700.00	\$0.00	\$0.00	Defer Funding
Irvine-FY04-Lingering Oil on Boulder-Armored Beaches	\$71,700.00	\$17,200.00	\$0.00	Defer Funding
Kline-FY04-Exchange between GOA and PWS	\$142,800.00	\$189,300.00	\$193,500.00	Defer Funding
Mann-FY04-Reconstructing Sockeye Populations	\$91,500.00	\$42,500.00	\$40,000.00	Defer Funding
Matkin-FY04-Killer Whales in PWS/Kenai Fjords	\$19,502.00	\$0.00	\$0.00	Defer Funding
Mazumder-FY04-Marine-Derived Nutrients	\$146,292.00	\$147,414.00	\$132,942.00	Defer Funding
Merritt-FY04-GEM Watershed Synthesis	\$58,091.00	\$39,751.00	\$0.00	Defer Funding
Rice-FY04-Lingering Population Status	\$60,000.00	\$61,000.00	\$29,100.00	Defer Funding
Vaughan-FY04-Hinchinbrook Entrance	\$81,799.00	\$0.00	\$0.00	Defer Funding
Total	\$1,339,434.00	\$778,965.00	\$665,942.00	
Ben-David-FY04-Transfer of Nutrients from Sea	\$0.00	\$0.00	\$0.00	Do not Fund
Berenstein-FY04-Pink Salmon Fry Survival	\$0.00	\$0.00	\$0.00	Do not Fund
Bird-FY04-Mobile Data Network-Marine Hwy	\$0.00	\$0.00	\$0.00	Do not Fund
Brown-Schwalenberg-FY04-Tribal Involvement in the GEM Program	\$0.00	\$0.00	\$0.00	Do not Fund
Foster-FY04-Community Science Dialogues	\$0.00	\$0.00	\$0.00	Do not Fund
Guay-FY04-Assessing Watershed	\$0.00	\$0.00	\$0.00	Do not Fund
Jack-FY04-Sea Otter Abundance	\$0.00	\$0.00	\$0.00	Do not Fund
Kopchak-FY04-Resource Mapping	\$0.00	\$0.00	\$0.00	Do not Fund
Kulkarni-FY04-Design for Data Management	\$0.00	\$0.00	\$0.00	Do not Fund
Lilly-FY04-Fate and Transport Modeling	\$0.00	\$0.00	\$0.00	Do not Fund
Pegau-FY04-Studying the ACC	\$0.00	\$0.00	\$0.00	Do not Fund
Renner-FY04-Population Modeling	\$0.00	\$0.00	\$0.00	Do not Fund
Schoch-FY04-Oceanographic & Ecological Process	\$0.00	\$0.00	\$0.00	Do not Fund
Wang-FY04-Building the GEM Infrastructure - Jia Wang	\$0.00	\$0.00	\$0.00	Do not Fund
EVOS TC-FY04- Data System	\$156,800.00	\$0.00	\$0.00	Funding Authorized
EVOS TC-FY04-ARLIS	\$160,900.00	\$0.00	\$0.00	Funding Authorized
EVOS TC-FY04-Public Information and Administration	\$863,300.00	\$0.00	\$0.00	Funding Authorized
EVOS TC-FY04-Scientific Management	\$391,600.00	\$0.00	\$0.00	Funding Authorized
Total	\$1,572,600.00	\$0.00	\$0.00	
Funding Authorized + Fund	4,431,214.00	1,636,142.00	1,489,999.00	
Funding Authorized + Fund + Contingent	4,764,314.00	1,678,442.00	1,504,099.00	
Funding Authorized + Fund + Contingent + Defer	6,103,748.00	2,457,407.00	2,170,041.00	

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Introduction

After exactly four years of intensive study and planning, August 1999 through August 2003, The FY 2004 Work Plan represents the first full fiscal year of the Gulf of Alaska Ecosystem Monitoring and Research Program, GEM. GEM is a truly unique opportunity to build the environmental baseline data that was generally lacking at the time of the *Exxon Valdez* oil spill, while starting a tradition of converting monitoring data into information products that serve the needs of government regulators and the public.

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 may span decades.

As a brief overview of what GEM is trying to learn, the largest information gaps in the northern Gulf of Alaska relate to how food and energy originating in the offshore marine environments are transported through the Alaska Coastal Current and nearshore areas to the watersheds. Accordingly, detecting changes in the variables that characterize the transfer of food and energy through the northern Gulf of Alaska is a top priority for the GEM Program. The GEM Program calls for building upward from oceanography through food and energy toward the large body of information that has accumulated within the management agencies over the past century on the abundance and biology of single species of large vertebrates such as seabirds, pelagic and anadromous fish, and marine and coastal mammals. In watershed and nearshore habitats where human activities are most prominent, it is important to find measures of how anthropogenic factors combine with human factors to influence these ecosystems. By filling gaps in how physical and human forces alter the transport of food and energy, changes in the large vertebrate species and prominent invertebrates, such as birds, shellfish, fish and mammals, can be understood in relation to a broad array of biological and physical observations throughout the region. In the long run, this comprehensive understanding of the ecosystems of the Gulf of Alaska is intended to lead to predictions of use to resource managers. In terms of types of long time series in these habitat types, observations on smaller to microscopic species of marine plants and animals, and physical and chemical observations from below the sea surface are widely lacking (GEM Program Document, Appendix D).

Starting in this fiscal year, 2004, efforts will focus on development of long-term moorings, stations, transects, and surveys in the nearshore and Alaska Coastal Current habitats, recognizing that the most expensive sampling zones to reach on a frequently recurring basis are the ACC and, at some point in the future, the offshore Gulf of Alaska. The limits on GEM fiscal resources likely will require maximum use of volunteer observing ships (VOS), which are commercial vessels that carry various monitoring

instruments. Preparing for instrumentation of VOS and establishing the necessary relationships with ship operators and crews should be a priority in FY 2004 - 2006.

In addition, a whole ecosystem (natural resource) model, as recommended by the National Research Council (NRC 2002) that links biological and physical observations across the habitat types, as well as the North Pacific, in order to understand changes in single species of interest to managers and concerned others. The GEM ecosystem model must be developed with a global perspective given the large spatial scales over which biological and physical phenomena operate. Identification and prioritization of the variables for the GEM program depend in large part on what is needed to operate the GEM ecosystem model. High priority variables needed in the GEM program are a composite of the variables essential to the workings of the GEM ecosystem model and its components: the ocean current model, the nutrient-phytoplankton-zooplankton (NPZ) models, and the Sound Ecosystem Assessment (SEA) pink salmon model (Willette et al 2001, Patrick et al 2003) (see Appendix F of the GEM Program Document). In assembling the GEM ecosystem model, emphasis will be placed on detecting changes in the variables that characterize the currents and the transfer of food and energy throughout the north Gulf of Alaska. In this way, changes in the large vertebrate species that are routinely monitored by state and federal government agencies can be better understood in relation to a broad array of biological and physical observations throughout the region.

Overview of the Response to the FY 2004 Invitation

Sixty-one proposals were received in response to the Invitation (Table 1). The proposals were not evenly distributed across the areas of the Invitation (Table 2), with the Alaska Coastal current receiving the largest response (12), followed by Lingering Oil Effects (11), Community Involvement (9), Watersheds (8), and Nearshore (9). Invitation areas Data Management (4), Modeling (4), and Synthesis (4) had relatively light responses, with only four proposals being received per area. Overall most proposals received were directly responsive to the invitation. Projects funded in FY 2003 that were invited to be considered for further continuation were each assigned to one of the eight areas of the Invitation.

Each proposal received a thorough and independent peer review in a two stage process (Table 3). In the first stage the proposals received 100 reviews from volunteers drawn from a world wide pool of scientists and other professionals who have volunteered to help the GEM Program by submitting their credentials through an automated web-based process to a database of peer review services. In the second stage each of the proposals received 122 reviews for the quality and relevance of the scientific or other professional content to the GEM Program by the Scientific Advisory Committee with the assistance of Dr. Robert Spies, Chair, Lingering Oil Subcommittee, Mr. Rob Bochenek, EVOSTC Data Systems Manager, and Mr. Brett Huber, Chair, GEM Public Advisory Committee. In total each proposal was read by an average of just less than four qualified individuals (Table 3).

The results of the peer review were distilled into recommendations from the STAC for each proposal, and the results of the peer review were distributed to the full Public Advisory Committee within one day after the conclusion of the deliberations. The PAC subsequently met at EVOSTC offices with the Executive Director, the Science Director, Data Systems Manager and Dr. Brenda Norcross, Co-Chair of the STAC, to discuss the proposals, the STAC recommendations, and to provide their own opinions on the proposals.

The Executive Director's first draft recommendations were circulated August 22, 2003 for public comment via e-mail to the approximately 1,000 people who have requested to receive Trustee Council information. The Executive Director's first recommendations were prepared in close consultation with the Science Director following the PAC meeting, and they were based on information developed by staff during review of the proposals, STAC comments and recommendations, PAC comments and recommendations, Science Plan priorities and available funding, among other considerations.

In addition to the findings developed for each project during the initial proposal review period ending 8/21/03, the final funding recommendations from the Executive Director (Table 1, Appendix A) are based on additional information that became available during the public review of the first draft recommendations (8/22/2003).

Table 1. Proposals submitted in alphabetical order by author and abbreviated title, funding recommended by fiscal year, FY 04 – FY 06, and Executive Director's funding recommendation as of 9/24/2003.

<u>Project Title</u>	<u>Funding Information</u>			<u>ED Recommendation</u>
<u>Fiscal year</u>	<u>FY04</u>	<u>FY05</u>	<u>FY06</u>	
Adams-FY04-Fisheries Management	\$46,760.00	\$0.00	\$0.00	Fund
Baird-FY04-Shoreline Habitat Mapping and Community-Based Monitoring	\$20,100.00	\$19,900.00	\$0.00	Fund
Batten-FY04-CPR data	\$135,200.00	\$135,200.00	\$135,200.00	Fund
Bechtol-FY04-Parameters in the N. Gulf of AK	\$50,900.00	\$54,000.00	\$56,000.00	Fund
Ben-David-FY04-Transfer of Nutrients from Sea	\$0.00	\$0.00	\$0.00	Do not Fund
Berenstein-FY04-Pink Salmon Fry Survival	\$0.00	\$0.00	\$0.00	Do not Fund
Bird-FY04-Mobile Data Network-Marine Hwy	\$0.00	\$0.00	\$0.00	Do not Fund
Bird-FY04-Mobile Data Network-Vessels	\$140,900.00	\$129,200.00	\$130,700.00	Defer Funding
Bishop-FY04-Top-down and Bottom-up Processes	\$149,529.00	\$164,030.00	\$151,390.00	Fund
Bodkin-FY04-Lingering Oil and Sea Otters	\$134,300.00	\$26,200.00	\$6,500.00	Defer Funding
Bodkin-FY04-Nearshore Monitoring Decision Process	\$10,000.00	\$0.00	\$0.00	Fund
Brown-Schwalenberg-FY04-Subsistence & Stewardship Gathering	\$31,250.00	\$0.00	\$0.00	Defer Funding
Brown-Schwalenberg-FY04-Tribal Involvement in the GEM Program	\$0.00	\$0.00	\$0.00	Do not Fund
Cokelet-FY04-AK Marine Highway System Ferries	\$171,500.00	\$185,900.00	\$145,900.00	Fund
Cooper-FY04-Community-Based Sampling	\$102,512.00	\$85,958.00	\$96,942.00	Fund
Couvillion-FY04-Coordinated Coastal Mapping	\$98,500.00			Defer Funding
DeLorenzo-FY04-Youth Area Watch	\$121,100.00	\$126,400.00	\$133,200.00	Defer Funding

<u>Project Title</u>	<u>Funding Information</u>			<u>ED Recommendation</u>
<u>Fiscal year</u>	<u>FY04</u>	<u>FY05</u>	<u>FY06</u>	
Devens-FY04-PWSRCAGE-EVOS long term program	\$141,700.00	\$0.00	\$0.00	Defer Funding
Eckert-FY04-Natural Variability in the Nearshore	\$36,300.00	\$17,500.00	\$0.00	Fund
EVOS TC-FY04- Data System	\$156,800.00			Fund
EVOS TC-FY04-ARLIS	\$160,900.00	\$0.00	\$0.00	Fund
EVOS TC-FY04-Project Management	\$140,000.00			Fund
EVOS TC-FY04-Public Information and Administration	\$863,300.00			Fund
EVOS TC-FY04-Scientific Management	\$391,600.00			Fund
Fall-FY04-Status of Subsistence Uses	\$298,700.00	\$25,600.00	\$0.00	Fund
Finney-FY04-Marine-terrestrial Linkages	\$79,197.00	\$80,154.00	\$81,117.00	Fund
Foster-FY04-Community Science Dialogues	\$0.00	\$0.00	\$0.00	Do not Fund
Guay-FY04-Assessing Watershed	\$0.00	\$0.00	\$0.00	Do not Fund
Heintz-FY04-Energy Allocation	\$48,400.00	\$42,300.00	\$14,100.00	Fund Contingent
Honnold-FY04-Marine-derived Nutrients on Sockeye Salmon	\$83,200.00	\$82,400.00	\$86,800.00	Fund
Irons-FY04-Bird Abundance in PWS	\$175,518.00	\$0.00	\$0.00	Fund
Irvine-FY04-Lingering Oil on Boulder-Armored Beaches	\$71,700.00	\$17,200.00	\$0.00	Defer Funding
Jack-FY04-Sea Otter Abundance	\$0.00	\$0.00	\$0.00	Do not Fund
Kiefer-FY04-Alaskan Groundfish Feeding Ecology	\$80,900.00	\$0.00	\$0.00	Fund
Kline-FY04-Exchange between GOA and PWS	\$142,800.00	\$189,300.00	\$193,500.00	Defer Funding
Knudsen-FY04-Nutrient-Based Resource Management	\$173,216.00	\$157,002.00	\$152,632.00	Fund
Konar-FY04-Natural Geography in Shore Areas	\$248,729.00	\$0.00	\$0.00	Fund
Kopchak-FY04-Resource Mapping	\$0.00	\$0.00	\$0.00	Do not Fund
Kulkarni-FY04-Design for Data Management	\$0.00	\$0.00	\$0.00	Do not Fund
Lilly-FY04-Fate and Transport Modeling	\$0.00	\$0.00	\$0.00	Do not Fund
Macklin-FY04-NGOA Metadatabase	\$100,600.00	\$0.00	\$0.00	Fund
Mann-FY04-Reconstructing Sockeye Populations	\$91,500.00	\$42,500.00	\$40,000.00	Defer Funding
Matkin-FY04-Killer Whales in PWS/Kenai Fjords	\$19,502.00	\$0.00	\$0.00	Defer Funding
Mazumder-FY04-Marine-Derived Nutrients	\$146,292.00	\$147,414.00	\$132,942.00	Defer Funding
McNutt-FY04-GEM Infrastructure	\$80,835.00	\$80,713.00	\$83,271.00	Fund
Merritt-FY04-GEM Watershed Synthesis	\$58,091.00	\$39,751.00	\$0.00	Defer Funding
Nelson-FY04-Hydrocarbon Database	\$22,200.00	\$22,200.00	\$22,200.00	Fund

<u>Project Title</u>	<u>Funding Information</u>	<u>ED Recommendation</u>		
<u>Fiscal year</u>	<u>FY04</u>	<u>FY05</u>	<u>FY06</u>	
Okkonen-FY04-Monitoring Program in the NE Pacific Ocean	\$27,289.00	\$30,366.00	\$31,455.00	Fund
Pegau-FY04-Studying the ACC	\$0.00	\$0.00	\$0.00	Do not Fund
Renner-FY04-Population Modeling	\$0.00	\$0.00	\$0.00	Do not Fund
Rice-FY04-Lingering Population Status	\$60,000.00	\$61,000.00	\$29,100.00	Defer Funding
Rosenberg-FY04-Harlequin Duck Population	\$37,100.00	\$0.00	\$0.00	Fund Contingent
Ruesink-FY04-Altering the Community Structure	\$81,600.00	\$0.00	\$0.00	Fund
Saupe-FY04-Habitat Web Site	\$21,100.00	\$0.00	\$0.00	Fund
Schneider-FY04-Kodiak Archipelago	\$63,000.00	\$63,000.00	\$63,000.00	Fund
Schoch-FY04-Oceanographic & Ecological Process	\$0.00	\$0.00	\$0.00	Do not Fund
Schumacher-FY04-GEM Infrastructure	\$22,067.00	\$23,645.00	\$22,067.00	Fund
Short-FY04-Monitoring Exxon Valdez Oil & PWS	\$45,900.00	\$0.00	\$0.00	Fund Contingent
Spies-FY04-EVOS Damage Assessment & Restoration	\$201,700.00	\$0.00	\$0.00	Fund Contingent
Stabeno-FY04-Bottom Control	\$49,500.00	\$0.00	\$0.00	Fund
Thorne-FY04-Seafood Waste Discharge	\$72,680.00	\$111,692.00	\$108,943.00	Fund
Vaughan-FY04-Hinchinbrook Entrance	\$81,799.00	\$0.00	\$0.00	Defer Funding
Walker-FY04-Marine Derived Nutrients	\$150,200.00	\$153,400.00	\$149,700.00	Fund
Wang-FY04-Building the GEM Infrastructure - Jia Wang	\$0.00	\$0.00	\$0.00	Do not Fund
Weingartner-FY04-Alaska Coastal Current	\$75,482.00	\$75,482.00	\$75,482.00	Fund
Willette-FY04-Monitoring ACC Dynamics	\$89,800.00	\$68,000.00	\$27,900.00	Fund

Fiscal Summary

	<u>FY04</u>	<u>FY05</u>	<u>FY06</u>
<i>Fund +Contingent:*</i>	<i>\$4,764,314</i>	<i>\$1,678,442</i>	<i>\$1,504,099</i>
<i>Defer</i>	<i>\$1,339,434\$</i>	<i>\$ 778,965</i>	<i>\$ 665,942</i>
<i>Grand Total</i>	<i>TBD</i>	<i>TBD</i>	<i>TBD</i>

* In FY 04 ONLY this includes funds for Data Management, Administration, Science Management and ARLIS combined. Amounts for EVOS Office in FY 05 and 06, as well as amount of funds allocated to deferred projects are to be determined.

Fiscal Graphics

The following figures provide graphical representation of pertinent statistics concerning various funding, invitation category, PI professional affiliation, and funding agency distributions for proposals requesting funding. Projects which are affiliated with EVOSTC administration are not represented in the figures below; only those projects replying to the invitation were taken into consideration during the generation of statistics. In addition, projects listed with the recommendation “Fund” or “Fund Contingent” were analyzed for the generation of fiscal graphics (Figures 1, 3, 4 and 5). Figure 2 concerns response to the invitation and takes into account all proposals disregarding what their recommendation status may be.

Yearly Recommended Funding (Fund + Fund Contingent) per Invitation Category

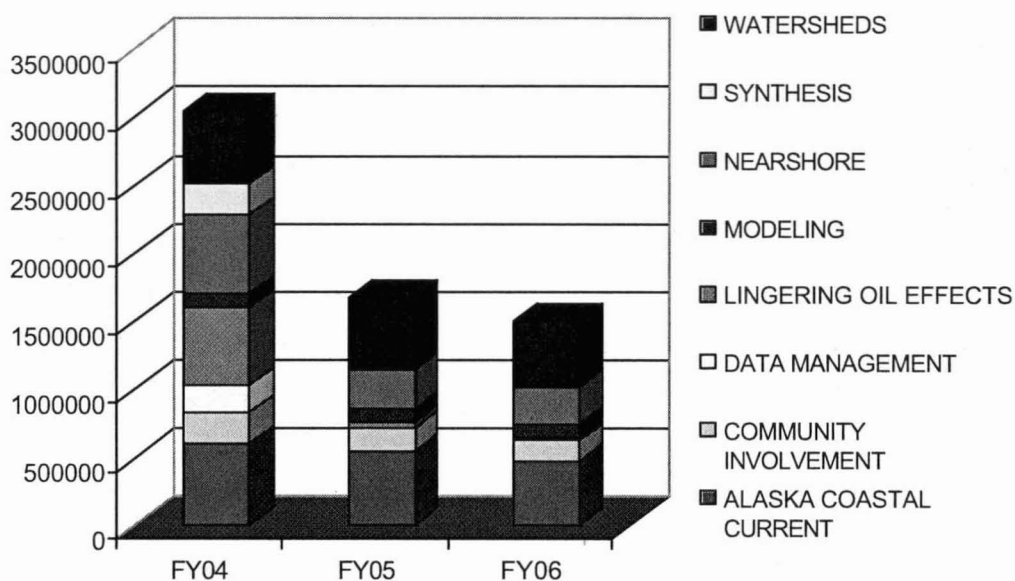


Figure 1. Recommended funding by fiscal year FY 04 – FY 06 per invitation category.

Notice the decreasing funding support for lingering oil effects as fiscal years progress. Other invitation categories persist at approximate consistent funding levels through fiscal iterations. This relationship points to the shift from restoration based funding towards GEM monitoring efforts.

Number of Proposals Received per Invitation Category

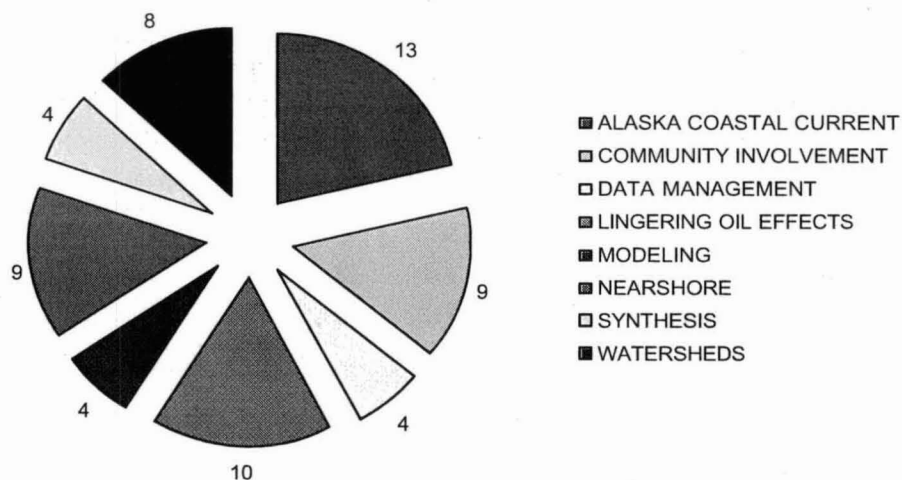


Figure 2. Number of proposals by area of the invitation received in response to the invitation

The overall response to the invitation broken down by invitation category shows that some categories generated little interest; while others attracted a substantial number of responses (Fig. 4). Among proposals selected to be recommended for funding (fund or fund contingent) the Alaska Coastal Current habitat type had the most positive recommendations at seven, but the recommendations were fairly evenly distributed across Invitation categories, from a low of 2 to a high of 7 (Fig. 3).

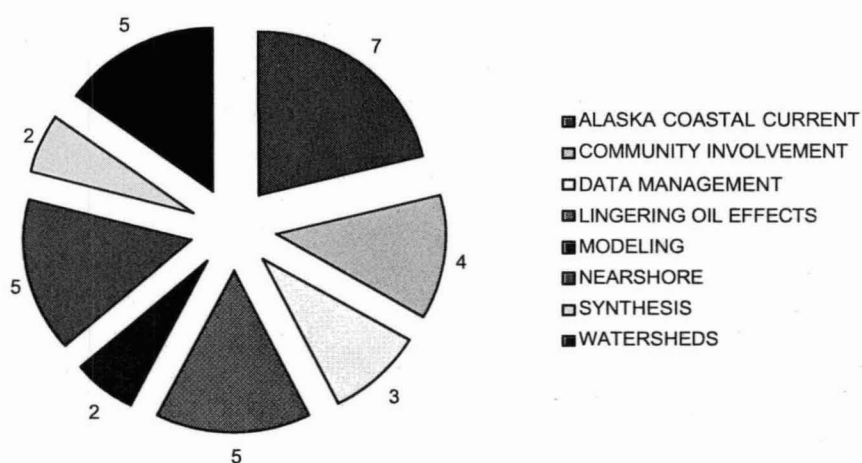


Figure 3. Number of proposals recommended for funding (Fund or Fund Contingent) by area of the Invitation.

Project Funding Distribution per PI Affiliation per Year

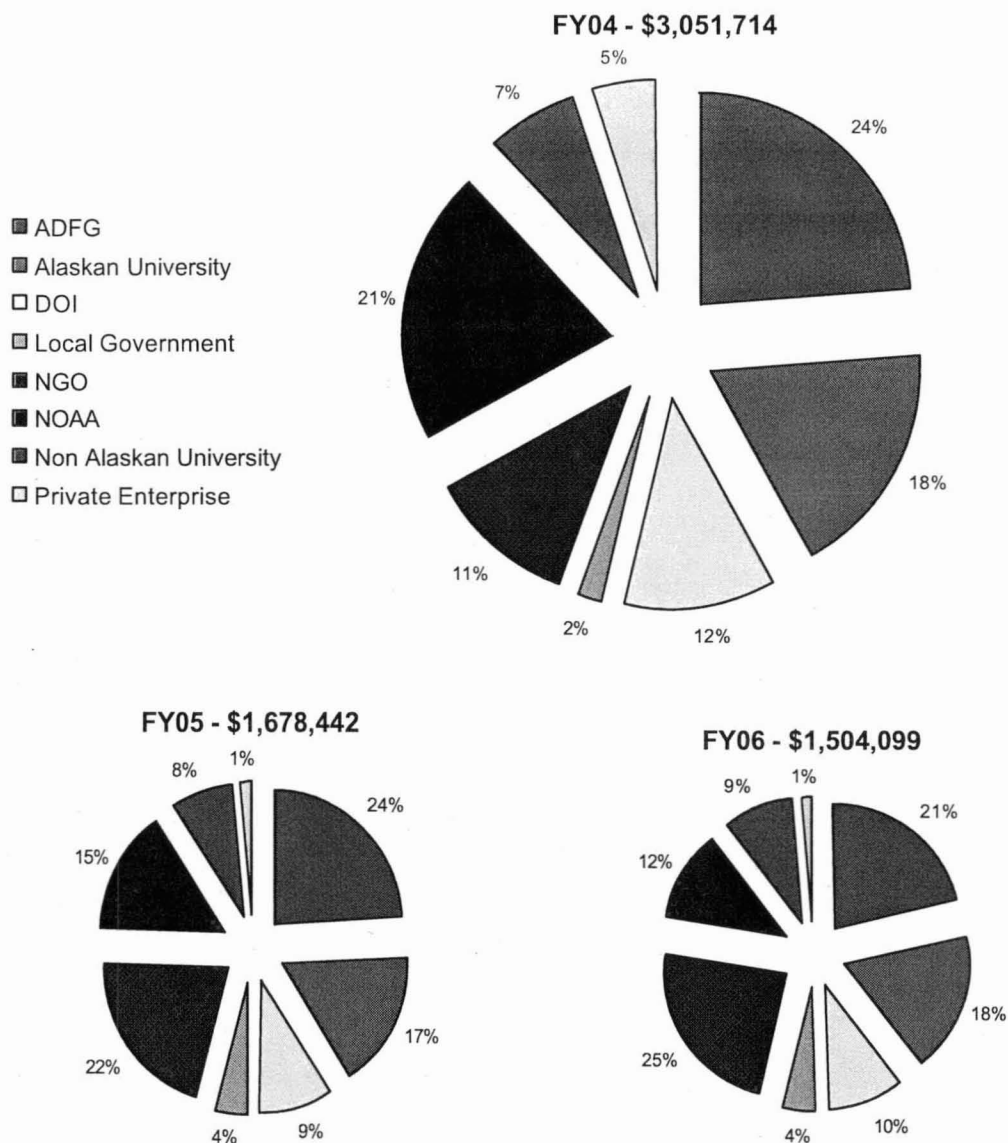


Figure 4. Recommended funding (Fund and Fund Contingent) amounts per PI professional affiliation broken down per fiscal year.

Institutional and agency affiliations of PI's show a fairly even distribution of positive recommendations for funding (fund and fund contingent). This figure does not describe agency funding channels for the movement of funds from EVOSTC to the projects, but provides statistics concerning what agencies and institutions received the funding for implementing projects.

Project Funding Distribution per Agency per Year

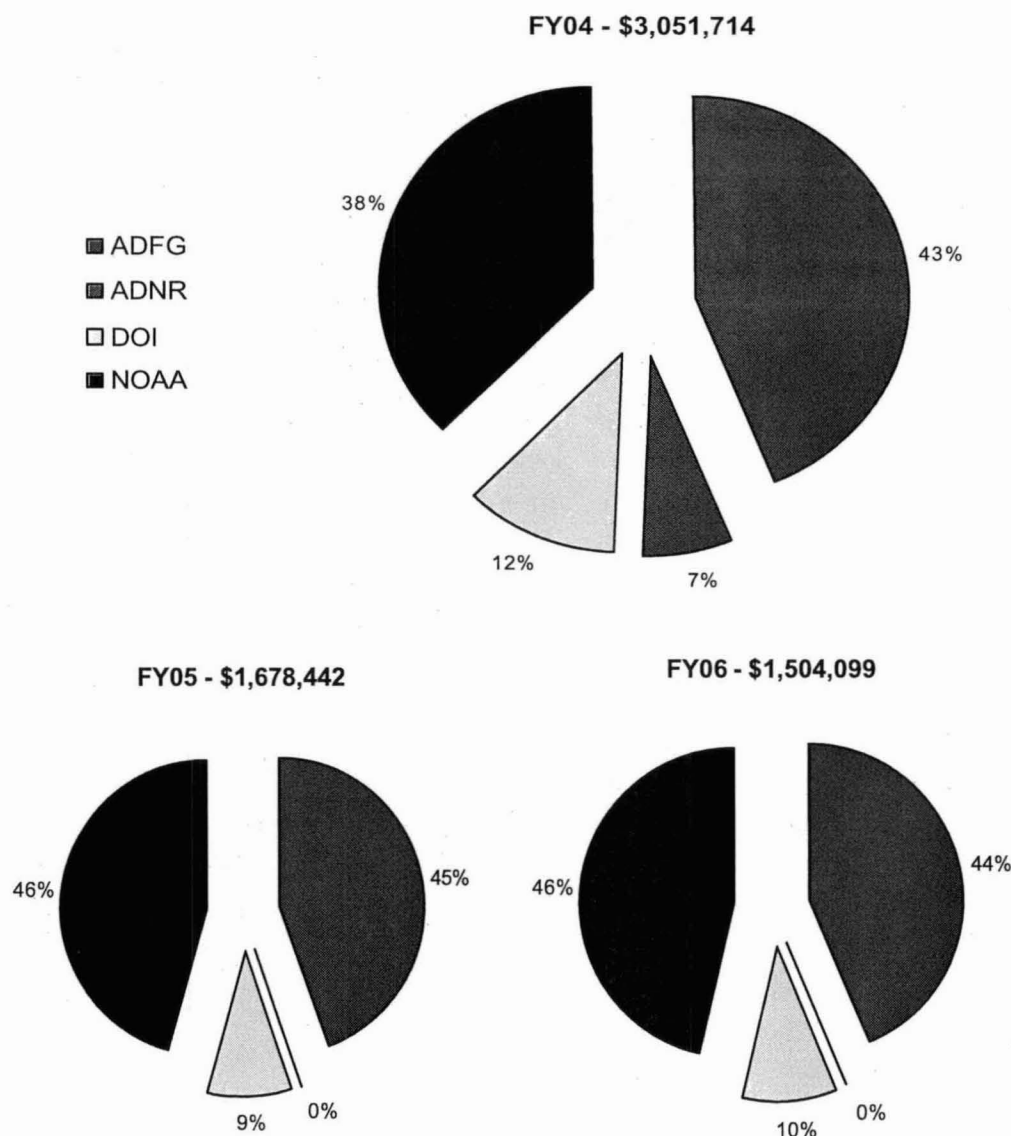


Figure 5. Recommended funding (Fund and Contingent) amounts administered by EVOS TC agency by fiscal year.

The above figure provides a distribution which describes agency funding channels for movement of funds to PIs broken down per fiscal year. The table below shows the amounts and number of projects per agency in FY 2004 only.

Trustee Agency	Number of projects	Proportion of funding	Amt disbursed	GA @ 9%
ADFG	14	0.43	\$1,312,237	\$118,101
NOAA	15	0.38	\$1,159,651	\$104,369
DOI	3	0.12	\$366,206	\$32,959
DNR	1	0.07	\$213,620	\$19,226
Totals	33		\$3,051,714	\$274,654

Table 3 Summary statistics for peer review results, number of non-STAC peer reviews received, range of non-STAC peer reviews received for each proposal, range of total (non-STAC + STAC) peer reviews for each proposal, average non-STAC peer reviews per proposal, and average total peer reviews per proposal

Number of Non-STAC Peer reviews Received	100
Number of STAC Reviews	122
Range of Non-STAC Peer Reviews per proposal	0-4
Range of Non-STAC + STAC Peer Reviews per proposal	2-6
Average Number of Non-STAC Peer Reviews per proposal	1.64
Average Number of Total Peer Reviews per proposal	3.64

Summary of Recommendations

The Executive Director recommends that the Trustee Council fund 34 projects (33 proposals plus one EVOSTC Program Management project, 040250) at this time for a total \$3.2M in FY 2004, \$1.7M in FY 2005, \$1.5M in FY 2006, for a total of \$6.4M in FY 2004 – 2006. In addition the Executive Director recommends that the Trustee Council defer action on 14 projects that total \$1.3M in FY 2004, \$0.67M in FY 2005, \$0.78M in FY 2006 for a total of \$2.8M in FY 2004 – FY 2006. Deferred projects may be brought before the Trustee Council for action later during FY 2004, based on availability of funding and other considerations explained in the definitions of deferred projects contained in the Notes to Reader (above). The Executive Director also recommends that another 14 projects be rejected for funding.

On approval of the 34 projects recommended for funding in this Work Plan, together with the budgets approved by the Trustee Council on September 3, 2003 the total authorized by the Council for FY 2004 would be \$4.8M in FY 2004, which is \$0.2M less than the FY 2004 funding cap of \$5M established by the Trustee Council. On adoption of the draft Work Plan the total of all funds approved by the Trustee Council for FY 2004 – FY 2006 would be \$8.0M, which is slightly more than half the \$15M now planned to be available during that time period.

By area of the Invitation for FY 2004 (Table 1.1 on page following) the largest dollar value of recommendations is in the Alaska Coastal Current (\$600K), followed by Lingering Oil Investigations (\$579K), Nearshore (\$562K), Watersheds (\$534K), Synthesis (\$238K), Community Involvement (\$232K), Data Management (\$203K) and Modeling (\$103K) (See also Fig. 4).

Table 1.1. Funding Recommended by Area of the Invitation (Fund and Fund Contingent)

	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>
<i>ACC</i>	\$599,671	\$548,948	\$471,937
<i>COI</i>	\$232,372	\$168,858	\$159,942
<i>DM</i>	\$202,600	\$0	\$0
<i>LO</i>	\$579,418	\$47,800	\$22,200
<i>MOD</i>	\$102,902	\$104,358	\$105,338
<i>NRS</i>	\$562,538	\$275,722	\$260,333
<i>SYN</i>	\$238,000	\$17,500	\$0
<i>WSH</i>	\$534,213	\$515,256	\$484,349
<i>Total</i>	\$3,051,714	\$1,678,442	\$1,504,099

Table 2. FY 2004 Proposal Recommendations by Area of the Invitation starts on page following

Table 2 FY 2004 Proposal Recommendations by Area of the Invitation

ALASKA COASTAL CURRENT

Batten FY04-CPR data
Bechtol FY04-Parameters in the N. Gulf of AK
Bird FY04 Mobile Data Network Marine Hwy
Bird FY04 Mobile Data Network Vessels
Cokelet FY04-AK Marine Highway System Fernes
Kline-FY04 Exchange between GOA and PWS
Matkin-FY04-Killer Whales in PWS/Kenai Fjords
Okkonen FY04 Monitoring Program in the NE Pacific Ocean
Pegau FY04 Studying the ACC
Stabeno-FY04-Bottom Control
Vaughan-FY04-Hinchinbrook Entrance
Weingartner FY04-Alaska Coastal Current
Willette FY04 Monitoring ACC Dynamics

ED RECOMMENDATIONS

Fund
Fund
Do not Fund
Defer Funding
Fund
Defer Funding
Defer Funding
Fund
Do not Fund
Fund
Defer Funding
Fund
Fund

COMMUNITY INVOLVEMENT

Adams FY04-Fisheries Management
Baird FY04-Shoreline Habitat Mapping and Community-Based Monitoring
Brown-Schwalenberg FY04 Subsistence & Stewardship Gathering
Brown-Schwalenberg FY04-Tribal Involvement in the GEM Program
Cooper FY04-Community-Based Sampling
DeLorenzo-FY04-Youth Area Watch
Foster-FY04-Community Science Dialogues
Kopchak-FY04-Resource Mapping
Schneider-FY04-Kodiak Archipelago

ED RECOMMENDATIONS

Fund
Fund
Defer Funding
Do not Fund
Fund
Defer Funding
Do not Fund
Do not Fund
Fund

DATA MANAGEMENT

Kiefer FY04-Alaskan Groundfish Feeding Ecology
Kulkarni FY04-Design for Data Management
Macklin FY04 NGOA Metadatabase
Saupe FY04-Habitat Web Site

ED RECOMMENDATIONS

Fund
Do not Fund
Fund
Fund

LINGERING OIL EFFECTS

Bodkin-FY04-Lingering Oil and Sea Otters
Fall FY04-Status of Subsistence Uses
Irons-FY04-Bird Abundance in PWS
Irvine-FY04-Lingering Oil on Boulder Armored Beaches
Lilly FY04-Fate and Transport Modeling
Nelson FY04-Hydrocarbon Database
Renner FY04-Population Modeling
Rice-FY04-Lingering Population Status
Rosenberg FY04-Harlequin Duck Population
Short FY04-Monitoring Exxon Valdez Oil & PWS

ED RECOMMENDATIONS

Defer Funding
Fund
Fund
Defer Funding
Do not Fund
Fund
Do not Fund
Defer Funding
Fund Contingent
Fund Contingent

MODELING

Berenstein FY04-Pink Salmon Fry Survival
McNutt FY04 GEM Infrastructure
Schumacher FY04 GEM Infrastructure
Wang FY04-Building the GEM Infrastructure Jia Wang

ED RECOMMENDATIONS

Do not Fund
Fund
Fund
Do not Fund

NEARSHORE

Bishop FY04-Top-down and Bottom-up Processes
Bodkin FY04 Nearshore Monitoring Decision Process
Couvillion FY04 Coordinated Coastal Mapping
Devens FY04-PWSRCAG-EVOS long term program
Jack FY04 Sea Otter Abundance
Konar-FY04-Natural Geography in Shore Areas
Ruesink-FY04 Altering the Community Structure
Schoch-FY04-Oceanographic & Ecological Process
Thorne FY04-Seafood Waste Discharge

ED RECOMMENDATIONS

Fund
Fund
Defer Funding
Defer Funding
Do not Fund
Fund
Fund
Do not Fund
Fund

SYNTHESIS

Eckert FY04 Natural Variability in the Nearshore
Mann FY04 Reconstructing Sockeye Populations
Merritt-FY04 GEM Watershed Synthesis
Spies-FY04-EVOS Damage Assessment & Restoration

ED RECOMMENDATIONS

Fund
Defer Funding
Defer Funding
Fund Contingent

WATERSHEDS

Ben David FY04-Transfer of Nutrients from Sea
Finney FY04 Marine-terrestrial Linkages
Guay FY04-Assessing Watershed
Heintz FY04 Energy Allocation
Honold FY04-Marine-derived Nutrients on Sockeye Salmon
Knudsen FY04-Nutrient Based Resource Management
Mazumder-FY04 Marine-Derived Nutrients
Walker-FY04-Marine Derived Nutrients

ED RECOMMENDATIONS

Do not Fund
Fund
Do not Fund
Fund Contingent
Fund
Fund
Defer Funding
Fund

Discussion of Proposals by Area of Invitation

Alaska Coastal Current

Introduction

Much of the Gulf of Alaska is a very deep (circa 4000m) reservoir of salty water bearing carbon and nutrients that would fuel biological production if transported to the surface waters of the GEM habitat types. Paradoxically, the ocean processes such as thermohaline circulation and upwelling that transport deeper waters toward the relatively shallow depths appear to be absent or short-lived in the northern Gulf. The opposite condition from upwelling, coastal downwelling is usually the case in the Gulf, particularly in winter. It is known that cross-shelf, surface Ekman transport in winter cannot account for the high nutrient concentrations observed on the inner shelf in spring (Childers 2000, Whitledge 2000). Other mechanisms are possible. In summer, when downwelling relaxes, salty, nutrient-rich water from offshore invades the inner shelf (Royer 1975), but the annual extent of the invasion varies and may be controlled by forces with periods of approximately two decades (Parker et al 1995). Vertical mixing is strong through the winter and redistributes fresh water, salt and possibly nutrients throughout the water column, so a combination of mechanisms possibly is involved in the annual nutrient re-supply to the inner shelf (GEM Program Document, Chapter 7.6.4).

Even though upwelling appears to occur only briefly in the Gulf (GEM Program Document, Chapter 7.6.2, Royer 1982, 2000, Reed and Schumacher 1986), the northern and western Gulf and adjacent waters are nonetheless highly productive of benthic, pelagic and littoral vertebrates (fish, birds and mammals) and benthic invertebrates such as crustaceans and mollusks (i.e. Feder and Jewett 1986, Cooney 1986, Martin 1997, Witherell 1999, Kruse et al 2000, Rogers et al 1986, Highsmith et al 1994, Purcell et al 2000, Rooper and Halderson 2000). Solving the mystery of the missing ecological mechanisms is essential to explain how the ingredients necessary for biological production of plants and animals (nutrients and food) are transported to be converted into the populations of fish, shellfish, birds, and mammals that are the centers of attention for natural resource management agencies and coastal economies.

A reasonable working solution to the mystery of the missing ecological mechanisms starts with the processes that change the strength of the factors driving the currents of the region (GEM Program Document, Chapter 7.6.4). Both the area of the ACC and adjacent shelf and slope are strongly affected by advection (mostly horizontal transport of momentum, energy, and dissolved and suspended materials by ocean currents), implying that climate perturbations, even those occurring far from the GEM study area, can be efficiently communicated into the northwestern GOA by ocean circulation (GEM Program Document, Chapter 7.6.2, p. 130). The strong advection also implies that processes occurring as far upstream as the northwestern contiguous United States might substantially influence biological production within the GEM habitat types.

Invitation Requirements

The top priority for GEM in the ACC starting in FY 04 is to initiate the process that leads to collecting basic physical (temperature and salinity) and biological observations (optical

measures, such as fluorescence) from a vessel of the Alaska Marine Highway System (AMHS) or other ship of opportunity operating in the waters of Prince William Sound, outer Kenai Peninsula, lower Cook Inlet, Kodiak and the Alaska Peninsula. Observations on these basic variables will be of use to a range of scientists, resource managers, and public members for multiple purposes and are fundamental to the future GEM modeling program. As part of this objective, continued development of the vessel-of-opportunity projects deploying the continuous plankton recorder and thermosalinograph into long-term projects is desirable. Another priority is to begin applying monitoring results to management of development activities in the ACC.

Synopsis of ACC Recommendations

Six of the seven proposals recommended for commitment of funding in the Alaska Coastal Current respond directly to the top priority of the Science Plan, which is to use ships of opportunity to acquire basic physical and biological observations (Batten, Bechtol, Cokelet, Okkonen, Stabenro and Willette). The seventh (Weingartner) is acquiring basic physical and biological observations from a mooring, GAK1, which is the second oldest continuous set of subsurface observations in the North Pacific.

Taken as a whole, the seven ACC projects recommended for funding provide the starting point for the backbone of long-term biological and physical observations to drive the GEM biophysical modeling effort recommended for funding below. The backbone to be provided by the GEM VOS is as yet incomplete, lacking coverage in Prince William Sound. The full implementation of the GEM ACC monitoring program must go hand in glove with the development of the GEM Model (see Modeling section below), since the exact placement of moorings, cruise transects and other monitoring platforms depends on the questions to be answered and the precision desired in the answers, which can only be understood through modeling. The data provided by these seven projects will be invaluable in getting the models to the point where they can be used to advise and inform the implementation of the full GEM ACC monitoring program, perhaps in FY 2010, depending on the support provided by the Integrated and Sustained Ocean Observing System (IOOS).

Of the four projects recommended to be deferred, two are directed at one of the top priorities in the Science Plan, understanding the exchange of water, nutrients and carbon between the Alaska Coastal Current and Prince William Sound (Vaughan and Kline). Voluntary observing ships would be developed inside Prince William Sound by the third deferred proposal (Bird), which is a geographic area not yet addressed by the other six VOS proposals now recommended for funding. The fourth deferred project would continue a long time series on killer whales (Matkin). Although the Matkin project was found not appropriate to the purposes of the lingering oil investigations, it would be desirable under the ACC Science Plan, as a low cost, highly leveraged project providing a record of the abundance and social structure of the penultimate apex predator.

The addition of the deferred ACC projects would complete the basic geographic coverage of the VOS program for the spill affected area, and provide the start on a data set that is essential to understanding changes in salmon and herring resources in Prince William Sound, as well as fluctuations of bird and mammal populations in the northern Gulf. Continuation of the killer whale time series at the proposed price is a bargain.

ACC Proposals Recommended for Funding and Deferral

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC.</i>
Batten-FY04-CPR data	\$135,200	\$135,200	\$135,200	Fund
Bechtol-FY04-Parameters in the N. Gulf of AK	\$50,900	\$54,000	\$56,000	Fund
Cokelet-FY04-AK Marine Highway System Ferries	\$171,500	\$185,900	\$145,900	Fund
Okkonen-FY04-Monitoring Program in the NE Pacific Ocean	\$27,289	\$30,366	\$31,455	Fund
Stabeno-FY04-Bottom Control	\$49,500	\$0	\$0	Fund
Weingartner-FY04-Alaska Coastal Current	\$75,482	\$75,482	\$75,482	Fund
Willette-FY04-Monitoring ACC Dynamics	\$89,800	\$68,000	\$27,900	Fund
<i>Fund + Contingent Totals</i>	\$599,671	\$548,948	\$471,937	
Matkin-FY04-Killer Whales in PWS/Kenai Fjords	\$19,502	\$0	\$0	Defer
Vaughan-FY04-Hinchinbrook Entrance	\$81,799	\$0	\$0	Defer
Kline-FY04-Exchange between GOA and PWS	\$142,800	\$189,300	\$193,500	Defer
Bird-FY04-Mobile Data Network-Vessels	\$140,900	\$129,200	\$130,700	Defer
<i>Defer Totals</i>	\$385,001	\$318,500	\$324,200	
<i>Grand Total</i>	\$984,672	\$867,448	\$796,137	

Community Involvement

Introduction

Meaningful public and community participation has long been an essential part of the Trustee Council's process and an essential strategy for implementing the GEM Program (GEM Program Document, Chapters 1 and 3; NRC 2002). Current and future GEM monitoring projects are encouraged to have a strong community involvement component whenever possible. Comprehensive strategies for incorporating community involvement in GEM projects are being developed now under GEM Project 030575 (GEM Program Community Involvement/Community-Based Monitoring Plan) for the Council's consideration in the fall of 2003. The report is expected to provide the basis for a thorough examination of the role of community involvement in the GEM program to be conducted by the executive Director during FY 2004. Until that examination is completed and the recommended community involvement approach reviewed, and adopted by the Council, only three specific community involvement projects are being recommended.

Invitation Requirements

Proposals were invited to develop specific products such as targeted workshops, databases, maps, publications, and community science symposia that provide services to communities and stakeholders in the GEM region related to marine ecosystem health and sustainability. Proposals were expected to establish their relevance to community needs, potential to develop community resources of potential use to other GEM projects, and their link to the goals of the GEM Program. The report on approaches to community involvement commissioned by the Trustee Council in FY 2003 will not be available until the end of September 2003. The report is expected to provide the basis for a thorough examination of the role of community involvement in the GEM program to be conducted by the Executive Director during FY 2004. Until that examination is complete, funding of community involvement projects will be based on responsiveness to the criteria in the FY 04 Invitation, past performance and future utility for implementing the GEM program.

Synopsis of Community Involvement Recommendations

The four community involvement proposals recommended for funding contribute directly to the Trustee Council objectives of 1) involving communities in the oil spill affected area in decisions on the questions addressed and the projects implemented (Adams), 2) converting data into products useful to communities and governments (Baird), and 3) involving members of the community in collecting long-term data sets relevant to the Science Plan (Cooper and Schneider).

Taken as a whole, the four community involvement proposals meet the criteria in the FY 04 Invitation for targeted workshops, information products, and community science meetings that provide services to communities and stakeholders in the GEM region related to marine ecosystem health and sustainability. Three of the four projects' principal investigators have excellent records of contributing to the development of the GEM program (Adams, Cooper, and Schneider) and all four projects show substantial future utility for implementing the GEM program. In addition, the four projects are expected to complement and support the efforts of the Executive Director to thoroughly examine the role of community involvement in the GEM program during FY 2004.

Addition of the two deferred projects would provide options for the Executive Director in working with the Chugach School District on developing a Youth Area Watch proposal that is compatible with the GEM program (DeLorenzo) and in working with the Chugach Regional Resources Commission on items of mutual interest in regard to the commemoration of the fifteenth anniversary of the oil spill (Brown-Schwalenberg).

Table of Community Involvement Recommendations on page following

Community Involvement Proposals Recommended for Fund and Defer

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC.</i>
Adams-FY04-Fisheries Management	\$46,760	\$0	\$0	Fund
Baird-FY04-Shoreline Habitat Mapping and Community-Based Monitoring	\$20,100	\$19,900	\$0	Fund
Cooper-FY04-Community-Based Sampling	\$102,512	\$85,958	\$96,942	Fund
Schneider-FY04-Kodiak Archipelago	\$63,000	\$63,000	\$63,000	Fund
DeLorenzo-FY04-Youth Area Watch	\$121,100	\$126,400	\$133,200	Defer
Brown-Schwalenberg-FY04-Subsistence & Stewardship Gathering	\$31,250	\$0	\$0	Defer
<i>Fund + Contingent Totals</i>	\$232,372	\$168,858	\$159,942	
<i>Defer Totals</i>	\$152,350	\$126,400	\$133,200	
<i>Grand Total</i>	\$384,722	\$295,258	\$293,142	

Data Management

Introduction

The Data Management and Information Transfer component of GEM includes the following functions: data receipt, quality control (QC), storage and maintenance, archiving and retrieval, administrative support, and the systems necessary to automate as many of these procedures as possible. This component also includes programs needed to create the custom data and information products that will be provided to the modeling and applications components, and to the users of this information. Data Management and Information Transfer provides the essential function of extracting the full scientific and societal benefits from GEM projects (NRC 2002; GEM Program Document, Chapter 9). Data generated by GEM projects need to be converted into useful information that is readily available in a timely fashion to the scientific communities, resource managers, resource dependent people and their communities, policy makers, and other members of the public. In addition, data sets and information regarding other research and monitoring activities in the GEM region must be readily accessible to EVOS staff and contractors, GEM committees and working groups (if any), state and federal resource agencies, and concerned members of the public in order to facilitate gap analysis during project selection and implementation, and maximize the use of all data collected (GEM Program Document, Chapter 3).

Invitation Requirements

Proposals were invited to construct a database of metadata describing marine related databases from the northern Gulf of Alaska relevant to GEM. Working from past and present efforts of GEM, PICES, NPRB, UAF/IMS, PMEL and others, projects would compile a list of databases related to the physical and biological features of the northern Gulf of Alaska and assess and analyze their potential relevance to GEM. Metadata descriptions of existing datasets would include thematic and semantic descriptors (i.e.,

study context such as PI, funding source and locality, species study association, listing of physical/biological measurements performed by study, and quantity and quality of measurements performed) In addition, a syntactic metadata description will be required which would include, but may not be limited to, file format, file size, and storage mechanism and location

The GEM objective is to create a comprehensive, web accessible georeferenced database of the marine-related physical and biological databases of the northern Gulf of Alaska, building on standards and systems already in place, such as the State of Alaska's Cooperatively Implemented Information Management System (CIIMMS) and the STORET database The successful proposals were expected to describe an approach that assigns priorities for inclusion of databases based on a combination of factors such as length of time series, use in existing physical or biological models, and relevance to GEM PIs of the successful proposal will be expected to work with GEM staff to create a list of predefined criteria which assigns a quantitative value summarizing the importance of the dataset to specific GEM efforts Cost efficiencies through cooperation, coordination, and integration with similar efforts covering related geographic areas are expected Ways and means of insuring close coordination with GEM modeling efforts should be described Essential requirements are ease of web access and export of information to other systems Consult GEM Program Document Chapters 8 and 9 and NRC Chapter 7 for further background

In addition to the metadatabase solicitation, the Invitation also asked for a pilot project to apply the Ocean Biological Information System (OBIS) within the GEM Region The proposals were expected to show how to set up a regional OBIS node by deploying an instance of the OBIS database structure In addition, the proposal would create a plan to facilitate the absorption into the regional OBIS node of past, present and future marine taxonomic data collection efforts Information on OBIS can be accessed via the web at <http://marine.rutgers.edu/OBIS/> Working with a resource management agency, the proposal would identify a manageable data and information system to host the pilot demonstration and provide an implementation schedule and plan for the OBIS software A successful proposal would define a method to isolate candidate historic datasets which have characteristics which lend themselves to be easily absorbed into the OBIS database structure Preference should be given to datasets that span multiple agencies The data system chosen for the pilot project is expected to have scientific relevance to themes presented in the GEM Program Document and GEM Science Plan

Synopsis of Data Management Recommendations

Two of the three data management proposals recommended for funding directly further GEM objectives by building a database of metadata describing marine related databases from the northern Gulf of Alaska relevant to GEM (Macklin) and by implementing a pilot project to apply the Ocean Biological Information System (OBIS) within the GEM Region (Kiefer) Both the metadatabase and OBIS projects are designed to make GEM data and the data of other sources needed by the GEM model and other projects readily and cheaply accessible OBIS is a national standard for making primarily biological data collected by agencies available, and the metadatabase project builds on a companion effort already funded by NOAA and the NPRB

The third data management proposal brings together and makes accessible much of the shoreline mapping data sets that have been gathered by GEM, Cook Inlet Regional Citizens Advisory Council, and others (Saupe). Developing coordination among shoreline mapping efforts and making information about all the data accessible in one place on the web was recommended by a GEM sponsored workshop earlier this year.

Community Involvement Proposals Recommended for Funding

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC.</i>
Kiefer-FY04-Alaskan Groundfish Feeding Ecology	\$80,900	\$0	\$0	Fund
Macklin-FY04-NGOA Metadatabase	\$100,600	\$0	\$0	Fund
Saupe -FY04-Habitat Web Site	\$21,100	\$0	\$0	Fund
<i>Fund + Contingent Totals</i>	<i>\$202,600</i>	<i>\$0</i>	<i>\$0</i>	
<i>Grand Total</i>	<i>\$202,600</i>	<i>\$0</i>	<i>\$0</i>	

Lingering Oil Effects

Introduction

The Trustee Council continues to be concerned about *Exxon Valdez* oil remaining in the marine environment and any effects it may be having on injured resources. Injured resources are identified and their current status described on the Trustee Council's web site at <http://www.oilspill.state.ak.us/facts/status.html>. Current objectives for the Lingering Oil Effects component of the Council's program are focused on examining the fate and effects of the remaining oil on injured resources and services and especially populations of two species in western Prince William Sound, harlequin ducks and sea otters. These populations have shown continuing exposure to hydrocarbons in localities where potentially toxic forms of oil from the *Exxon Valdez* are known to persist. Objectives for FY 04 also include learning about the status of subsistence uses of the injured resources in the spill affected areas for comparison to an earlier survey in 1998.

The reasons that some populations of injured species in Prince William Sound have not met the criteria established for their recovery in the nearly 14 years since the oil spill are still not clear. For some species it has not been possible to clearly separate the possible toxic effects of oiling from the possible effects of natural causes such as climate change and predation. For this reason, GEM projects that address injured species and ecosystems are designed to understand the effects of natural forces on populations and their productivity. The knowledge gained may permit at least a retrospective understanding of oil injury versus other impacts for species injured by *Exxon Valdez* oil, and provide the background on natural forces necessary to understand effects of oiling in future oil spills.

Invitation Requirements

Proposals were invited to examine the fate and effects of *Exxon Valdez* oil in western Prince William Sound. Proposals specifically addressing these effects on populations of sea otters and harlequin ducks were of interest. Proposals were also requested to examine the status of subsistence activities in the spill affected areas. In addition to the objectives and examples described here, proposers may use this invitation to suggest other approaches to aid the recovery of other resources and services that were identified by the Trustee Council as having been injured by the oil spill. However, the Trustee Council's emphasis in FY 04 will be on development of the GEM Program as its primary restoration activity.

Studies were invited on bioavailability of lingering Oil in Prince William Sound. Research conducted in Prince William Sound in 2001 estimated that about 28 acres of intertidal beach remain contaminated from spilled *Exxon Valdez* oil. The Trustee Council is interested in evaluating the bioavailability of this oil to sea otters and harlequin ducks in the Prince William Sound area. Proposals were invited to evaluate foraging activities of sea otters in oiled areas, collect sea otter mortality, emigration and population data, and monitor harlequin duck recovery. Studies were also invited on monitoring of presence of lingering oil. The Trustee Council is interested in establishing a strategy for monitoring persistence of *Exxon Valdez* oil, and its relationship to other sources of contamination in Prince William Sound.

A follow-up study to the 1998 survey of subsistence uses in spill affected Areas was invited. The last complete survey of the status of subsistence uses in spill-impacted communities was conducted in 1998. FY 04 is six years later, and the Trustee Council will consider proposals to evaluate the status of subsistence uses by collecting, analyzing, and reporting information about current subsistence uses in a subset of oil spill area communities using methodology that is comparable with previous research results. The evaluation is expected to be a collaborative effort in which the study communities are partners in each phase of the study.

Synopsis of Lingering Oil Recommendations

Four of the five lingering oil proposals recommended for funding relate directly to the Trustee Council's basic responsibilities to monitor the long-term effects of the oil spill and the status of injured species (Fall, Irons, Rosenberg) or to maintain evidence of oiling (Nelson). The fifth (Short) offers to address the tasks necessary to integrate long-term monitoring of lingering oil effects into GEM projects. Taken together the five proposals address the most pressing needs of the Trustee Council for linking the investigations of the Restoration program on injured species to the GEM Program, and to meeting basic legal requirements for maintenance of physical data.

The three deferred projects would look at fate of the *Exxon Valdez* oil outside Prince William Sound (Irvine) and at the fate and effects of oil inside Prince William Sound (Bodkin-Lingering and Rice). In addition, two of the three (Rice and Bodkin-Lingering) may also provide information on damages that could not have been foreseen at the time of the settlement of the governments' civil claims against what was then Exxon Corporation. Outstanding questions relating to the deferral are what was learned

during the 2003 field season, and what could be learned in the 2004 field season that is essential to the interests of the Trustee Council. Such information will not be available until after November 7, 2003, so the recommendations on the projects could not be formulated beyond deferral.

Lingering Oil Proposals Recommended for Funding and Deferral

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC.</i>
Fall-FY04-Status of Subsistence Uses	\$298,700	\$25,600	\$0	Fund
Irons-FY04-Bird Abundance in PWS	\$175,518	\$0	\$0	Fund
Nelson-FY04-Hydrocarbon Database	\$22,200	\$22,200	\$22,200	Fund
Rosenberg-FY04-Harlequin Duck Population	\$37,100	\$0	\$0	Fund Contingent
Short-FY04-Monitoring Exxon Valdez Oil & PWS	\$45,900	\$0	\$0	Fund Contingent
Rice-FY04-Lingering Population Status	\$60,000	\$61,000	\$29,100	Defer
Irvine-FY04-Lingering Oil on Boulder-Armored Beaches	\$71,700	\$17,200	\$0	Defer
Bodkin-FY04-Lingering Oil and Sea Otters	\$134,300	\$26,200	\$6,500	Defer
<i>Fund + Contingent Totals</i>	\$579,418	\$47,800	\$22,200	
<i>Defer Totals</i>	\$266,000	\$104,400	\$35,600	
<i>Grand Total</i>	\$845,418	\$152,200	\$57,800	

Modeling

Introduction

One of the top overall priorities for the GEM Program is to develop a whole-ecosystem natural resource model as an adaptive management tool for guiding the GEM monitoring program (see GEM Program Document, Chapter 8, and NRC 2002, Chapter 7). An interdisciplinary biophysical modeling effort is essential to developing monitoring efforts in all of the habitat types, as well as the data management and information transfer component of the program. Modeling helps to understand the limitations on what can be learned from sampling in different time and space scales through simulations based on data from the projects. The ultimate long-term purpose of the model is to describe, in relation to biological and physical variables, the abundance through time of seabird, marine mammal and fish species that are selected for relevance to management interests. Modeling is also used to identify and refine measures, such as time series of biological or physical measurements that are best suited to communicate publicly the current status of the ecosystem for the GEM contribution to a Gulf of Alaska section in a North Pacific Ecosystem Status Report now under development by PICES and others.

Invitation Requirements

Proposals were invited that address how an interdisciplinary biophysical model of the northern Gulf of Alaska would be developed in the short-term. As envisioned, building the model would start from existing physical and biological models; hence, the means of cooperation, coordination, integration, and achieving cost efficiencies with existing modeling efforts must be emphasized in a successful proposal. Ways and means of communicating the contents, functions and outputs from the model to a variety of different disciplines and across a variety of common operating systems should also be carefully described, as well as data assimilation strategies for selecting time and space scales for biological and physical monitoring.

Synopsis of Modeling Recommendations

The two proposals recommended for funding (McNutt and Schumacher) are related and complementary activities designed to assemble the team necessary to produce the GEM biophysical model, and to conduct the workshops necessary to begin the consensus building process in the scientific and other types of communities. It is expected that the community assembled by McNutt and Schumacher will be able to provide guidance to the EVOSTC STAC and staff on how to craft future Invitations for Proposals in support of the modeling effort, as well as contribute to the development of invitations for proposals for the monitoring programs for the four habitat types.

Modeling Proposals Recommended for Funding

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC.</i>
McNutt-FY04-GEM Infrastructure	\$80,835	\$80,713	\$83,271	Fund
Schumacher-FY04-GEM Infrastructure	\$22,067	\$23,645	\$22,067	Fund
<i>Fund + Contingent Totals</i>	\$102,902	\$104,358	\$105,338	
<i>Grand Total</i>	\$102,902	\$104,358	\$105,338	

Nearshore

Introduction

Most of the objectives for the nearshore in FY 04 will be met by projects underway in FY 2003 and expected to continue in FY 2004. Continuing projects are expected to receive the bulk of the funding. However, an additional objective to increase the incorporation of human effects into the research on nearshore monitoring, in order to begin applying monitoring results to management of human activities in the nearshore, was invited.

Invitation Requirements

Proposals were invited to analyze the information needed to support resource and environmental management decisions for human activities in the nearshore. Building on

the GEM Program Document (see especially Chapter 7 14-15), the proposals were expected to analyze the information needed to support resource and environmental management decisions for a range of human activities (oil and gas development, seafood processing, tourism and recreation, etc) in the nearshore in one of the major geographic regions of the GEM area (Prince William Sound, Cook Inlet or Kodiak-Afognak) Working in close cooperation with state and federal agencies actively engaged in resource and environmental management activities and reviewing the current scientific literature, the analysis was expected to identify gaps by comparing information needed by managers to that actually available The analysis was to address all aspects of the suitability of past, current and future data and information products needed to support resource and environmental management decisions

Synopsis of Nearshore Recommendations

Of the five nearshore proposals recommended for funding, three are to continue efforts underway in FY 2003 that are expected to lead to designs for nearshore monitoring stations and strengthened community involvement in nearshore investigations (Bishop, Konar, Ruesink) in FY 2005 or FY 2006 One project (Bodkin-Nearshore) is the conclusion of an effort to build a geographically referenced database of past nearshore investigations to guide site selection and design of nearshore monitoring stations The fifth project recommended for funding (Thorne) adds the dimensions of seafood waste discharge monitoring to research into the design of nearshore monitoring stations not present in any of the other nearshore projects

Taken together, the five nearshore proposals recommended for funding provide a strong start to implementing the nearshore monitoring program, making it likely that the nearshore will be the first of the habitat types to enter the monitoring phase envisioned in the Science Plan The presence of a nearshore synthesis effort in FY 2004 (Eckert, see Synthesis section below) combined with earlier planning efforts funded by EVOSTC that were led by Carl Schoch, Ginny Eckert and Tom Dean, makes the nearshore habitat type the most advanced As a result of these five projects, the Synthesis project, and their precursors, the call for nearshore monitoring implementation proposals could be part of the FY 2006 Invitation for Proposals

Addition of one of the two deferred projects would initiate the much needed formal coordination of nearshore mapping efforts (Couvillion) that goes well beyond that provided by the low cost website (Saupe) recommended under the Data Management area of the Invitation The coordination effort was originally recommended for funding because it was endorsed by the EVOS sponsored workshop on mapping of coastal habitats earlier this year, and it would contribute valuable resources to the process of site selection and implementation of nearshore monitoring stations However fiscal constraints not foreseen at the time of the fund recommendation have changed the recommendation on this project to deferral

Addition of the other deferred project (Devens) would allow the Science Director and the Executive Director to develop a partnership with the Prince William Sound Regional Citizen's Advisory Council to incorporate an existing time series of data on contaminants into nearshore monitoring (the PWSRCAC's LTEMP project) Building on the results of the joint PWSRCAC-GEM project in FY 2003 that have not yet been evaluated, the Devens proposal would be adapted to make LTEMP responsive to the needs of GEM nearshore monitoring

Nearshore Proposals Recommended for Funding and Deferral

Proposal	FY 2004	FY 2005	FY 2006	ED REC.
Bishop-FY04-Top-down and Bottom-up Processes	\$149,529	\$164,030	\$151,390	Fund
Bodkin-FY04-Nearshore Monitoring Decision Process	\$10,000	\$0	\$0	Fund
Konar-FY04-Natural Geography in Shore Areas	\$248,729	\$0	\$0	Fund
Ruesink-FY04-Altering the Community Structure	\$81,600	\$0	\$0	Fund
Thorne-FY04-Seafood Waste Discharge	\$72,680	\$111,692	\$108,943	Fund
Couvillion-FY04-Coordinated Coastal Mapping	\$98,500	\$0	\$0	Defer Funding
Devens-FY04-PWSRCAC-EVOS long-term program	\$141,700	\$0	\$0	Defer Funding
Fund + Contingent Totals	\$562,538	\$275,722	\$260,333	
Defer Totals	\$240,200	\$0	\$0	
Grand Total	\$802,738	\$275,722	\$260,3	

Synthesis

Introduction

The required scientific guidance for implementing the GEM program is based on putting together ideas, pieces of information from the scientific literature, and the potential relations among existing data gathering programs, including GEM (see Chapter 3 of the GEM Program Document for further information), to form a larger picture. Synthesis is the entry point to the cycle of monitoring and research. Synthesis builds on past experience to update the current understanding of the northern Gulf of Alaska marine ecosystems. It brings together existing data and information from any number of disciplines, times and regions to evaluate different aspects of the GEM Program's conceptual foundation, central hypotheses and related ideas, working from the perspective of a habitat type.

The primary purposes of the synthesis activities in FY 2004 are to (1) fully develop the introduction to the habitat types in the GEM Science Plan and (2) point out options for projects that might be implemented in FY 06 and beyond.

Invitation Requirements

Proposals were invited to provide a synthesis of scientific literature and existing data gathering programs to serve as the introduction to the GEM Science Plan sections for three of the four GEM habitat types: Alaska Coastal Current, nearshore and watersheds. Bearing in mind that the boundaries of habitats are not rigidly drawn (Chapter 2, GEM Program Document), proposals were expected to concentrate on one habitat type. However, each proposal was also expected to address linkages of its habitat type with the other habitat types. In addition, proposals were to demonstrate how the synthesis would proceed from the primary source documents for GEM--the GEM

Program Document, the GEM Science Plan, and the National Research Council's GEM review book (A Century of Ecosystem Science, 2002), and Exxon Valdez Oil Spill Restoration Plan - Update on Injured Resources and Services (August 2002), all found at <http://www.oilspill.state.ak.us/gem/documents.html>) -- to incorporate scientific literature and data gathering activities not addressed in the source documents. In addition, synthesis documents were to be designed incorporate, to the extent they are available, the results of Restoration Program research, as developed in the three- year EVOS Restoration Project /600 (Synthesis of the Ecological Findings from the EVOS Damage Assessment and Restoration Program). Methods were to include consultation with EVOS staff and contractors, GEM committees and relevant working groups (if any), state and federal resource agencies and concerned members of the public. At a minimum, the results of the synthesis were to be presented orally at a public meeting and should be suitable for publication as a review article, as well as incorporation into the relevant sections of the GEM Science Plan and the Gulf of Alaska section of a North Pacific Ecosystem Status Report now under development by the North Pacific Science Organization (PICES, see EVOSTC-Science Management Project).

Synopsis of Synthesis Recommendations

The two proposals recommended for funding are essential to guiding the development of the Science Plan and the implementation of the GEM program (Eckert and Spies). The offer of synthesis for the nearshore habitat type (Eckert) comes at critical time in program development (see Nearshore section above). Thanks to the early start for GEM nearshore projects in Phase II of FY 2003 (see FY 2003 Work Plan), enough progress has been made in the nearshore to issue a call for implementation of monitoring in FY 2006. The synthesis of Restoration work, and particularly of the ecologically oriented projects (Spies) is critical because the scientific background of the GEM Program document is largely lacking in these results. The results of most of the ecological study programs undertaken during Restoration (SEA, APEX, NVP) were not available when the scientific background was written in FY 2001. As a result, the scientific background needs to be updated with the synthesis of Restoration work provided by the Spies synthesis effort, and the Science Plan needs the benefit of this work as well.

One of the synthesis proposals recommended for deferral was a promising offer to develop a watershed synthesis (Merritt) that was lacking in a number of specific aspects requested by the Invitation for Proposals, as envisioned in the Science Plan. A deferral in this case would offer the Science Director the flexibility to work with the author to develop a project to deliver this badly needed synthesis. The Trustee Council is being asked by this draft Work Plan to make a major investment during FY 2004 – FY 2006 in research leading to a watershed monitoring program. As explained above, the synthesis is essential to coordinate the information produced by that investment, and to guide the STAC and Science Director in developing the FY 2007 Invitation for Proposals for implementation of the GEM watershed monitoring program. The other deferred project (Mann), was recommended by the Public Advisory Committee for re-consideration. It would guide development of the watershed monitoring program, and needs to be done, however fiscal constraints preclude a fund recommendation.

3

Synthesis Proposals Recommended for Funding and Deferral

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC.</i>
Eckert-FY04-Natural Variability in the Nearshore	\$36,300	\$17,500	\$0	Fund
Spies-FY04-EVOS Damage Assessment & Restoration	\$201,700	\$0	\$0	Fund Contingent
Merritt-FY04-GEM Watershed Synthesis	\$58,091	\$39,751	\$0	Defer
Mann-FY04-Reconstructing Sockeye Populations	\$91,500	\$42,500	\$40,000	Defer
<i>Fund + Contingent Totals</i>	\$238,000	\$17,500	\$0	
<i>Defer Totals</i>	\$149,591	\$82,251	\$40,000	
<i>Grand Total</i>	\$387,591	\$99,751	\$40,000	

Watersheds

Introduction

Most coastal watersheds in southcentral Alaska and elsewhere in the North Pacific are thought to be heavily influenced by marine nutrients (MDN) and carbon carried inland by animals such as salmon, river otters, bald eagles, and harlequin ducks, yet very little is actually known about the extent of this influence, and no monitoring programs currently measure marine effects. Without MDN information, human non-point source pollution cannot be distinguished from natural events such as the effects of salmon spawning. Commercial and recreational fisheries for salmon are at risk of curtailment without MDN information, since the actual degree of dependence of potentially threatened or endangered terrestrial mammals, such as brown bear, on marine sources is not known, but is now presumed to be high. Without adequate measures and routine monitoring of MDN, regulations to reduce pollution and lower risks to listed species may be unnecessarily injurious to the economy, ineffectual, or both. Understanding of past oil spill injuries would be enabled and future oil related injuries would be more readily diagnosed.

The initial focus of the GEM watershed program is to conduct research on how to measure the known marine related indicators: stable isotopes of carbon, nitrogen and sulfur (C, N, S) and proxies for marine related sources of nutrients and food, such as standard water quality indicators (nitrates, ammonium). Answers are needed to the following questions: What are the best indicators? Are C, N, and S equally useful as indicators of marine linkages in all types of watersheds? Are concentrations of nitrates and ammonium in freshwater suitable proxies for stable isotopes? Are there other suitable proxies for marine-related indicators? What is the variability of marine related indicators in bodily tissues among species within watersheds? Which species or species guilds are best suited to measuring marine linkages? How do suitable species vary among different types of watersheds, i.e., heavily forested, anadromous, non-anadromous, recently glaciated, heavy human development, pristine, and so forth? What are the indicators of terrestrial influences in nearshore marine environments?

Invitation Requirements

Proposals were supposed to identify and show how and where to measure the best indicators of marine-related biological production in watersheds, including within an existing water quality monitoring program. Three areas were emphasized in the Invitation:

- Detection of Marine-Related Indicators
- Community Based Sampling Strategies for Sampling Marine-Related Indicators
- Including Marine Related Variables in an Existing Water Quality Monitoring Program

Synopsis of Watershed Recommendations

The five watershed proposals recommended for funding represent a well coordinated and integrated package of research to be conducted throughout the spill affected areas that will lead to the implementation of at least a rudimentary GEM watershed monitoring program in FY 2007 (Finney, Heintz, Honnold, Knudsen, and Walker, see also Cooper under Community Involvement section). Geographic coverage is provided for a broad variety of coastal watersheds adjacent to Prince William Sound (Knudsen), Cook Inlet (Walker and Heintz), and Kodiak (Finney and Honnold). All recommended projects except Heintz offer to study stable isotopes as indicators of terrestrial-marine linkages, however the studies offer complementary coverage of different types of watersheds (lake-bearing, peat wetlands, glacial runoff), localities within and nearby watersheds (headwaters, mid-reaches, mouth, delta and nearshore), resident and anadromous fish species, measures of water quality, limnological observations and primary productivity. Four of the five proposals recommended responded to the requests for Community Based Sampling Strategies for Sampling Marine-Related Indicators, and Including Marine Related Variables in an Existing Water Quality Monitoring Program (Finney, Honnold, Walker and Heintz). The Heintz project alone offers immediate management applications through measures of the allocation of marine derived resources among growth and bodily structures of fish that can be used to understand survival. Survival of species is basic information for fishery managers.

Taken together, the five recommended projects would provide enough information in three years (FY 2004 – FY 2006) to design sampling for terrestrial-marine linkages that would lead to a call for proposals for a GEM watershed monitoring program in FY 2007. As pointed out in the Science Plan, the current understanding of terrestrial-marine linkages and how to measure them is not well developed enough to expect that the final monitoring program would be initiated in FY 2007, but at least enough should be known that a useful body of systematic observations could be identified. Research and modeling may be needed for an additional decade before the final GEM watershed monitoring program can be identified.

The deferred project (Mazumder) would make an excellent addition to the package of watershed proposals, however the budget submitted in the revised proposal co-mingled matching and EVOSTC funds so that it was unclear what objectives could be accomplished in the absence of the matching funds, which have not been committed.

Watershed Proposals Recommended for Funding and Deferral

<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC.</i>
Finney-FY04-Marine -terrestrial Linkages	\$79,197	\$80,154	\$81,117	Fund
Honnold-FY04-Marine -derived Nutrients on Sockeye Salmon	\$83,200	\$82,400	\$86,800	Fund
<i>Proposal</i>	<i>FY 2004</i>	<i>FY 2005</i>	<i>FY 2006</i>	<i>ED REC.</i>
Knudsen-FY04-Nutrient-Based Resource Management	\$173,216	\$157,002	\$152,632	Fund
Walker-FY04-Marine Derived Nutrients	\$150,200	\$153,400	\$149,700	Fund
Heintz-FY04-Energy Allocation	\$48,400	\$42,300	\$14,100	Fund Contingent
Mazumder-FY04-Marine-Derived Nutrients	\$146,292	\$147,414	\$132,942	Defer
<i>Fund + Contingent Totals</i>	\$534,213	\$515,256	\$484,349	
<i>Defer Totals</i>	\$146,292	\$147,414	\$132,942	
<i>Grand Total</i>	\$680,505	\$662,670	\$617,291	

Appendix of Abstracts, and Recommendations of STAC & ED

Please note that the abstracts in Appendix A were written by the authors of the proposals to describe their projects. To the extent that the abstracts express opinions about the status of injured resources or priorities for the GEM program they do not represent the views of the Executive Director, the Science Director or other staff of the Exxon Valdez Oil Spill Trustee Council, nor do they reflect policies or positions of the Trustee Council.

Project Adams-FY04-Fisheries Management

Project Title Fisheries Management Applications - Submitted under the BAA

Location Prince William Sound

Proposer Kenneth Adams

Proposer Affiliation Private Enterprise

Lead Agency NOAA

Funding Recommendations

FY04 \$46,760 00

FY05 \$0 00

FY06 \$0 00

Abstract

The proposal is submitted under the category of Community Involvement. The project, begun in March of FY-02, will continue to build bridges between the scientific community and resource managers, enhancement programs, subsistence and other stakeholder user groups. The scientific community is describing and attempting to predict variation in biological production whereas, the commercial fishing community desires application for this new information. We will develop a Mini-Symposium of the annual GEM workshop for presentation in small communities. We will also continue the successful series of workshops created in Cordova for identification of PWS fishery community issues and needs and will seek resolution of the identified issues and needs by application of EVOSTC supported research. The results contained in the Sound Ecosystem Assessment (SEA) program are especially valuable to this process. This project provides clear and positive opportunities for the resource dependent community to become involved in GEM and can also help identify how products of GEM can be made meaningful to the community.

STAC Recommendation

This proposal is for three additional years of funding for Prince William Sound Fisheries Research Applications and Planning (PWSFRAP). This was originally funded as a pilot project for 1.5 years. It has been highly successful in that the proposers have used this venue to inform and involve the Cordova community in issues of fisheries, especially those that were examined as part of SEA research. The PIs have been extremely involved in GEM, Adams has attended all the public components of the GEM process and has relayed the knowledge to an interested Cordova community. These PIs made a presentation to the GEM PAC in Cordova in June. Their project was very well received by the PAC. The proposal is well written and includes lots of objectives to get scientific information to the public and to get information back from them. Unfortunately, the proposal is rather weak on the methods of how these objectives will be accomplished. This proposal specifically fulfills the invitation in that it proposes to conduct "mini-symposia" that are synopsis of the annual EVOS meeting. It is disconcerting that the proposal does not give any details about how the mini-symposia are expected to be done. Past community workshops have

been highly successful and these should be continued. Objective to bring symposium events to villages is important, but it is not clear that current technology is adequate. The budget is well above the \$10-20 K limit suggested in the Invitation. The STAC recommends the proposal be revised to provide some specific methods for extending the successful workshop approach employed in Cordova to other communities in the spill area for an amount not to exceed \$20K. Fund reduced for one year, amount contingent upon receipt of revised proposal.

Executive Director's Recommendation

The project has proven effective in working with the fishing community in Cordova to identify projects for GEM that are important to the long-term economic development of Prince William Sound. It has also been effective in communicating the potential benefits of the GEM program to the Cordova fishing community. The revised proposal identifies how the project is expected to continue its excellent record of success in building community involvement by extending its work to other communities in the spill region. Fund

Project *Baird-FY04-Shoreline Habitat Mapping and Community-Based Monitoring*

Project Title Connecting with Coastwalk Linking Shoreline Habitat Mapping with Community-based Nearshore Monitoring in Kachemak Bay

Location Kachemak Bay

Proposer Steve Baird

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$20,100 00

FY05 \$19,900 00

FY06 \$0 00

Abstract

The project will merge high-resolution mapping of the physical structure of the nearshore environment in Kachemak Bay with a citizen-generated biological and human impact data collected over 18 years of an annual Kachemak Bay Coastwalk shoreline survey into a GIS. The integration of data, refinement of data collection protocols, and piloting of revised protocols will occur during Year 1. During Year 2, the potential for use of the combined methodology for long-term GEM community-based nearshore monitoring will be assessed. The project will culminate in a Kachemak Bay community/scientist workshop to integrate and synthesize information and apply the GIS results to the selection of nearshore monitoring sites for community-based monitoring. This project will advance the development of a community-based nearshore monitoring program for the GEM program.

STAC Recommendation

The proposal is responsive to the invitation (nearshore, community involvement) and is consistent with GEM strategies (incorporate community involvement and local knowledge) and goals (detect change, provide information to facilitate understanding of causes of change). KBRR is completing EVOS project 030556 mapping project (to be used to overlay biological or human impact data). The project concludes with a Kachemak Bay community/scientist workshop to present results, introduce GEM monitoring strategies, and develop opportunities for community involvement in nearshore monitoring. The project provides a link between nearshore community-based information and long-term monitoring applicable to GEM. In short, the project will build on an existing (18 year) citizen-based, volunteer monitoring program (that is presumably responsive to community concerns) and combine it with a GEM-funded GIS mapping project to assess the utility of this method for future GEM monitoring. There needs to be more discussion of the compatibility of the 18-year data set with the more recent mapping project (030556), and how the two will be linked. The proposal needs to provide the missing CV for Sigman and a definition of role of Schoch. Methods need elaboration and more rigor in the explanations. Revision needs to provide an example of a problem that can be addressed using the data set and particularly the utility of the data set to the long-term monitoring activities in GEM. Recommendation: Fund contingent on receipt of revised proposal responsive to peer reviewer concerns.

Executive Director's Recommendation

The proposal presents an excellent opportunity to build two-way communication between GEM and the public regarding nearshore monitoring needs. Deficiencies identified by the staff and the peer reviewers have been addressed in the revised proposal. Fund.

Project Batten-FY04-CPR data

Project Title Acquisition and Application of CPR data in the Gulf of Alaska - Submitted under the BAA

Location Alaskan shelf and Gulf of Alaska

Proposer Sonia Batten

Proposer Affiliation Non Alaskan University

Lead Agency NOAA

Funding Recommendations

FY04 \$135,200 00

FY05 \$135,200 00

FY06 \$135,200 00

Abstract

Plankton are a critical link in the marine food chain that respond rapidly to climate change and form the link between the atmosphere and upper trophic levels. Many important marine resources in the GoA are strongly influenced by changes in ocean climate. Recent CPR data have shown significant changes occurring in all plankton communities in the GoA, associated with the recent climate shift. We will continue the acquisition of CPR data in the Gulf of Alaska on the current transect that crosses the ACC and add an additional transect in FY05 that will sample the ACC further 'downstream' and provide baseline, seasonal plankton data for the lower Cook Inlet and its transition to the Gulf of Alaska. We also propose analysis of data already collected to investigate the links between plankton and juvenile salmon migrations, and the larval distribution of commercially important decapods sampled by the CPR.

STAC Recommendation

Batten and Welch, using resources of the Sir Alister Hardy Foundation for Ocean Science (SAHFOS), GEM and NPRB, have been conducting continuous plankton recorder (CPR) studies in the Gulf of Alaska since 1998. Those were initially exploratory, but have been run consistently in a time-series monitoring mode since March 2000. Roughly monthly transects are run through the spring each year from Hinchinbrook Entrance to Long Beach by CPRs towed by oil tankers. In addition, a transect has been run several times in recent years from Vancouver, B.C. to Yokohama. Among other things, the results show (1) the north-south seasonality gradient of the large, particle grazing copepods of the GOA (earlier south, later north), (2) evidence of transport into oceanic waters of coastal zooplankton by recurring (or persistent) eddies along the BC coast, and (3) clear evidence correlating with more coast-bound studies of faunal changes occurring at the apparent pelagic regime shift at the end of the 1990's. Three strong publications have resulted from the work so far, covering those results, and Dr. Batten also has been active in studies and publications on the statistical validity of CPR work generally. Community involvement includes the volunteer observing ship activity itself, and preparation and loading of CPRs by community college personnel in Valdez. The proposal emphasizes the value of zooplankton time series for early identification of regime shifts and other responses of the pelagic ecosystem to climate change. Present funds available to GEM do not justify committing to the expanded transects in FY 05 and 06 in light of need to establish other vessels of opportunity programs. Fund project as written for FY 04 through FY 06 at funding level of FY 04.

Executive Director's Recommendation

Past performance of investigators has been exemplary in all respects, and the project is producing information on long-term changes in conditions that affect production of birds, fish and mammals in the Gulf. Responsiveness of investigators to requests for information and reporting deadlines is very good. Present funds available to GEM do not justify committing to the expanded transects in FY 05 and 06 in light of need to establish other vessels of opportunity programs. Possibility is recognized that changes in vessels may occur, and that some changes in routing may be expected as a result. Project is to be conducted with FY 04 objectives and funding levels from FY 04 through FY 06. Fund

Project Bechtol-FY04-Parameters in the N Gulf of AK

Project Title Monitoring Ecosystem Parameters in the Northern Gulf of Alaska

Location Kachemak Bay, Cook Inlet

Proposer William Bechtol

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$50,900 00

FY05 \$54,000 00

FY06 \$56,000 00

Abstract

This project will refine long-term monitoring of forage species populations in Cook Inlet, an area representative of ecosystem conditions and changes in the northern Gulf of Alaska. Finfish and shellfish will be sampled annually in May with a small-mesh, bottom trawl to determine whether competitive and predatory interactions or different responses to the environment may be favoring the abundance of one species over another. Project funding includes mounting a thermosalinograph on the survey platform to collect surface temperature and salinity data during all fieldwork conducted by the survey vessel throughout the calendar year. Products will include annual reports, presentations at scientific meetings, and a manuscript submission to a peer-reviewed journal. Project data will be also made available to other researchers to facilitate broader ecosystem modeling for the Gulf of Alaska. The study will incorporate community outreach and education involving local science classes in the collection of field data.

STAC Recommendation

GEM has an actual monitoring project here to support. There's an old and excellent time series to continue and upgrade. It concerns once commercially important animals (pink shrimp, bottom fish) in a coastal inlet (Kachemak Bay) with well populated (by Alaska standards) shores. The time series shows interannual or, just as likely, interdecadal change in the bottom fauna. Probably the once per year schedule is enough to show interannual changes. The trawling involved does no more habitat harm than a) has long since been done and b) possibly is sustained by current fishing activity, although these points deserve informed review. Station numbers are large enough to generate some statistics and stations are well enough distributed to show aerial variability. The agency that originated the survey cannot justify the resources to sustain it solely as a normal management agency function since stocks of the initial target species, pink shrimp, has declined well below the point of commercial interest. However, providing coastal fishing communities and scientists at management agencies with an early warning of the return of pink shrimp (the possible "crustacean mode" of the ecosystem) would be of considerable value, value that can accrue to GEM's credit. Agency should be encouraged to do anything practical with the samples to generate better insight as to what drives the shrimp-fish switching. Replace the thermosalinograph with station profiling by means of a SeaCat or similar device, such as a simple, self-contained CTD (e.g., the Seabird model is ca \$8K) lowered at each of the many stations before the trawl is shot. If a weight (30# downrigger ball) is suspended 2 m below the CTD, it can be lowered until the weight hits, giving data from very close to the bottom. Over the station grid as a whole this would give a strong characterization of the system hydrography, much better than any number of surface values. Fund contingent on receipt of revised proposal implementing above recommendations.

Executive Director's Recommendation

The project meets GEM needs for data that can be used to detect changes in natural resources in the Gulf of Alaska and to develop an understanding of the factors responsible for that change. It also responds to a GEM mandate to leverage funding through partnerships with existing programs and projects, and represents a reasonable division of financial responsibilities between EVOSTC and ADF&G. It will add value to a long-term trawl survey by providing oceanographic data that can be used to understand changes in the trawl catches due to natural forcing. Revised proposal incorporated peer review comments to substantially improve the value and quality of the oceanographic data to be collected. Fund

Project Ben-David-FY04-Transfer of Nutrients from Sea

Project Title Forecasting Climatic Effects on the Transfer of Nutrients from Sea to Land by Coastal River Otter

Location Prince William Sound (no field work)

Proposer Merav Ben-David **Proposer Affiliation** Non-Alaskan University

Lead Agency NOAA

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

Gradual (climatic) or catastrophic (oil spills) events that could change the abundance and distribution of spawning pelagic fishes in the nearshore environment of the Gulf of Alaska (GOA) will likely affect the abundance and behavior of coastal river otters. These changes will reduce transfer of nutrients by otters from sea to land and change landscape heterogeneity and biodiversity of the terrestrial ecosystem. Using the relation between abundance and distribution of fishes and otter abundance and behavior, we propose to develop a model that will forecast changes in landscape heterogeneity of coastal forests along the GOA with projected climate change. Input data will be based on output from climate-ocean-fish interaction models developed through GEM. Output data will be in the form of digital maps describing deposition of N and P along the coast based on the relations between fish and river otters.

STAC Recommendation

This is a well crafted and thoroughly professional proposal that is unfortunately well ahead of the developmental path established in the Science Plan. In contrast to the Science Plan, the proposal assumes that measures of marine linkages in coastal watersheds are well established and can be used to model the role of MDN in shaping species diversity coastal forests. Although the authors presented a strong case for control of species composition and productivity by the input of marine nutrients to coastal Alaskan watersheds, it assumes that the measures necessary are well established (C and N) and it does not fully address the fundamental sampling variability issues for measures of marine influences identified in the Invitation. The proposal shows promise of eventually being successful in the area of modeling within the GEM program, however that program area is just being initiated in FY 04 and is not ready to receive this proposal. Do not fund.

Executive Director's Recommendation

The proposal is promising but premature with respect to GEM modeling needs. The authors are encouraged to get in touch with the GEM Model group in order to understand when such a proposal would be needed in the future. Do not fund.

Project *Berenstein-FY04-Pink Salmon Fry Survival*

Project Title Community Assessment and Implementation Planning Regarding the SEA Model for Pink Salmon Fry Survival

Location Prince William Sound, Alaska

Proposer C A Berenstein

Proposer Affiliation Non-Alaskan University

Lead Agency NOAA

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

Early implementation of research has been used by Alaskan _fishing communities to turn troubled times into ones of renewal and growth For Prince William Sound, one counts the revitalization of optimum escapement management at statehood, the engineering development of Bams' experiments with Turfgrass in incubators, and the use of technology and a systems perspective in the SEA Science Plan In each case, the resource at the center was pink salmon Ten years ago, diverse communities focused on pinks the resource looked to be in trouble Today, the resource and the communities are in trouble if reduced to indistinguishable commodities This project responds to the call for an implementation plan for research that protects the resource The approach draws upon the community resources and traditions that produced past successes The goal is a plan that will produce a broadly based distinguishing contribution

STAC Recommendation

Berenstein et al propose to establish an infrastructure to address the survival of pink salmon in Prince William Sound. The sampling tool is coded wire tags and it will depend on concurrent physical measurements Much of the proposal is based on yet to be published results and findings so the veracity of this proposal is questionable For example, on page 3, it is stated that the connection between fry survival is water temperature for fish and advection for zooplankton but there is no reference for this statement They will need zooplankton densities and physical parameters but will not be gathering them themselves High resolution data would be required especially in the spring to address the effects of the fry releases Their assumption that oceanographers and meteorologists are gaining an understanding of the system and making useable forecasts is not justified They also ignore the ocean conditions and carrying capacities The proposal does not contain certain required elements such as bios of the investigators The budget was not well justified The Gantt chart is not sufficient Roles of the PIs are poorly delineated Funding of this proposal is not recommended

Executive Director's Recommendation

A model of pink salmon fry survival that meets the information needs of the fishing and aquaculture industries in Prince William Sound is in the interest of understanding recovery from the oil spill, and for supporting economic development activities Unfortunately the proposal did not meet the needs and standards established in the Invitation for Proposals for this modeling activity Do not fund.

Project Bird-FY04-Mobile Data Network-Marine Hwy

Project Title Alaska Marine Highway System Marine Weather and Conditions Mobile Data Network

Location Prince William Sound and Gulf of Alaska

Proposer Nancy Bird

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

Marine weather and sea conditions have been identified as important elements in the GEM program for processes controlling ecosystem interactions, marine-traveler safety, resource agencies, marine-resource industries, and emergency spill-response activities. This project brings together communities, stakeholders, agencies, and technology specialists to expand an existing data and telemetry network in Prince William Sound and the Northern Gulf of Alaska. The Alaska Marine Highway System (AMHS) provides a platform for contributing data to the GEM program, local communities, and industry. We will integrate data-collection systems on AMHS vessels working in Prince William Sound and North Gulf of Alaska, incorporating one vessel each year over a three-year period. We will use varied telemetry methods to maximize data access to AMHS vessels and public in near-real-time reporting systems. The system design has been structured to provide valued information to AMHS operations and end-users through a group effort aimed at building a sustainable network.

STAC Recommendation

It is proposed to instrument one Alaska Marine Highway ferry in each of three project years to gather weather data on a continuous basis. The proposal fails to say specifically what will be done with this data although the proposal does indicate that the data will be used somehow to improve both short term weather knowledge around PWS and to generate a long-term data set for the variables measured. The short-term products will be made available on the internet. No explicit details of data archiving are offered. Since in reasonably short order gigabytes of data will be accumulating, some serious plan is in order. No meteorologist or oceanographer is associated with the project. For GEM's purposes, careful archival work with products of the present PWS weather network would be more valuable than records from wandering ships. Do not fund.

Executive Director's Recommendation

See the Executive Director's recommendation on the other proposal from this author. A partnership with OSRI/PWSSC serving the same purposes proposed will be explored through the deferral of the other Bird proposal. The number of substantial technical issues identified during peer review prevent pursuing this proposal at this time. Do not fund.

Project *Bud-FY04-Mobile Data Network-Vessels*

Project Title Alaska Vessels of Opportunity Marine Weather and Conditions Mobile Data Network

Location Prince William Sound

Proposer Nancy Bird

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$140,900

FY05 \$129,200 00

FY06 \$130,700 00

Abstract

We are bringing together communities, stakeholders, agencies, and technology specialists to expand an existing weather network in Prince William Sound (PWS) by incorporating Vessels of Opportunity (VOO) Marine weather and sea conditions are identified as important elements for GEM, marine-traveler safety, resource agencies, marine-resource industries, and emergency spill-response activities VOO provide a means for contributing data to GEM and PWSSC programs, local communities, and industry We will integrate data-collection systems on three types of vessels working in PWS, they include small day-cruise vessels in North PWS, a SERVS escort vessel, and a charter vessel operating throughout PWS These vessels represent different types of operations, travel patterns and user groups Telemetry methods will be employed to provide near-real-time weather and water-conditions data reporting System design is focused on providing valued information to vessel operations and end-users and will be coordinated with equivalent efforts on Alaska Marine Highway Vessels

STAC Recommendation

This proposal parallels and supplements Bird's Alaska Marine Highway (AMH) proposal It is proposed to use ~\$110 per year in each project year to prepare four boats operating locally in PWS with mobile weather stations reporting by automated radio As was the case with the AMHS proposal, this proposal fails to say specifically what will be done with this data although the proposal does indicate that the data will be used somehow to improve both short term weather knowledge around PWS and to generate a long-term data set for the variables measured No explicit details of data archiving are offered Since in reasonably short order gigabytes of data will be accumulating, some serious plan is in order No meteorologist or oceanographer is associated with the project For GEM's purposes, careful archival work with products of the present PWS weather network would be more valuable than records from wandering ships Do not fund

Executive Director's Recommendation

Collecting oceanographic data from vessels of opportunity from a base of operations within Prince William Sound is expected to be a highly cost effective means of detecting changes in the environment that change populations of birds, fish and mammals impacted by the oil spill A partnership with OSRI/PWSSC appears to offer a promising means of pursuing this low cost data collection method A number of substantial technical issues identified during peer review need to be resolved before the proposal can proceed Defer

Project ***Bishop-FY04-Top-down and Bottom-up Processes***

Project Title Trophic Dynamics of Intertidal Soft-Sediment Communities Interaction between Top-down and Bottom-up Processes (Renewal, Submitted under the BAA)

Location Southeast Prince William Sound (Orca Inlet) and the Copper River Delta

Proposer Mary Anne Bishop **Proposer Affiliation** NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$149,529 00 **FY05** \$164,030 00 **FY06** \$151,390 00

Abstract

Vast expanses of intertidal sand/mudflats serve as a critical link in the food web of nearshore communities along the southcentral Alaska coastline. The rich abundance of benthic invertebrates residing within the sediments of intertidal flats and the large network of subtidal channels that bisect these flats provide a significant prey resource for numerous species of fish, crabs, birds, and marine mammals. One of the largest expanses of intertidal mud/sand flats occurs in the Copper River Delta and southeastern Prince William Sound (Orca Inlet). Here we propose a large-scale field study that examines the physical/chemical and biological factors that limit and/or regulate invertebrate community dynamics. The largely “bottom-up” approach we propose (physical/chemical parameters – phytoplankton/epibenthic production – invertebrate production) is balanced by the largely “top-down” focus of a companion project funded by the Prince William Sound Oil Spill Recovery Institute that examines predator dynamics and assesses their role in invertebrate community dynamics. At the completion of this project (FY 06), the results of both projects will be synthesized and a subset of key physical/chemical parameters will be identified for long-term monitoring.

STAC Recommendation

This proposal takes advantage of the PWSSC location and complementary funding to develop the ‘bottom-up’ sampling program to match a ‘top-down’ project already in place. The proposed sampling is intensive and reasonably extensive in space and time, and it is therefore comparatively expensive. The concept of understanding trophic dynamics from both ends is certainly attractive, if, in fact, they meet in the middle. The project will establish a baseline of biodiversity in the habitat. Long-term the project will need to address the sustainability of a monitoring program built around helicopter sampling. Fund

Executive Director’s Recommendation

The proposal meets an essential GEM objective by continuing research into understanding how to monitor soft sediment nearshore habitats nearby the oil spill affected areas. It is highly leveraged with outside funding and helps develop a desirable partnership with a regional marine lab, PWSSC. Fund

Project *Bodkin-FY04-Lingering Oil and Sea Otters*

Project Title Lingering Oil and Sea Otters Pathways of Exposure and Recovery Status
(continuation of project 030620)

Location Prince William Sound

Proposer James Bodkin

Proposer Affiliation DOI

Lead Agency DOI

Funding Recommendations

FY04 \$134,300 00

FY05 \$26,200 00

FY06 \$6,500 00

Abstract

Some of the strongest evidence of continuing effects of lingering oil from the Exxon Valdez oil spill comes from long term monitoring of sea otter populations and their exposure to hydrocarbons. Population recovery remained incomplete as of 2002, and individual sea otters continue to exhibit elevated levels of the Cytochrome P450 1A biomarker in areas where lingering oil deposits are most prominent. Work in progress is quantifying home ranges of sea otters at northern Knight Island relative to known intertidal lingering oil deposits, but relocation sampling limits our ability to link foraging behaviors to oiled shorelines. To address the question of where individuals are foraging relative to lingering oil requires data on foraging depths. In 2003 USGS will be instrumenting 20 of the radio-instrumented sea otters at Knight Island with time-depth-recorders. These instruments will provide accurate information on the proportion of each individual's foraging that occurs in intertidal habitats, the area where known oil deposits remain, for one full year. Surveys of population size and individual P450 measures will provide continuing information on population trend and individual exposure to lingering oil.

STAC Recommendation

This is a well thought out proposal for further work on the sea otters around northern Knight Island, Prince William Sound, which are clearly not recovering to their pre-spill numbers. The research plan maps out a clear strategy that will attempt to link biomarker of contaminant exposure, P4501A, with individual behavior, particularly foraging, in contaminated areas of Northern Knight Island. Of particular interest will be the outcome of attempts to link biomarker response in individual animals to their foraging in patches of contaminated prey. This proposal conforms to the strategy of determining if there is a close link between remaining deposits of oil in PWS and population problems of species in the area. While this is a challenging undertaking the investigators have a proven track record with this sort of approach and have shown that they can take the measurements necessary to test the hypotheses. The results are to be prepared for publication in a peer reviewed journal before attendance at the meeting in FY 06. 1 The proposed work is highly relevant to further work on species not recovered from the spill. Therefore, it is responsive to the invitation for FY 04. 2 Technical merit high. 3 Relevance to management and community involvement is moderate. 4 Qualifications and past performance are both excellent. 5 Recommendation: Defer pending outcome of November workshop.

Executive Director's Recommendation

The specific requirements for further work on lingering oil need to be further developed during a workshop to be conducted in November 2003. As identified by the STAC, it is important for the preliminary results of the FY 2003 field season to be considered by legal counsel, EVOS staff,

advising scientists and the Trustee Council before decisions on funding are made. The exchange between legal, policy and science people will be reported to the Trustee Council before making decisions on what to do in the summer of 2004, which is the last full field season of data that could be fully analyzed before deciding the path to the re-opener. Defer funding decisions pending the outcome of the November workshop.

Project *Bodkin-FY04-Nearshore Monitoring Decision Process*

Project Title Monitoring in the Nearshore A Process for Making Reasoned Decisions (close-out of Project 030687)

Location No field work Study areas in the Gulf of Alaska

Proposer James Bodkin

Proposer Affiliation DOI

Lead Agency DOI

Funding Recommendations

FY04 \$10,000 00

FY05 \$0 00

FY06 \$0 00

Abstract

Over the past several years, a conceptual framework for the GEM nearshore monitoring program has been developed through a series of workshops. However, details of the proposed monitoring program, e.g. what to sample, where to sample, when to sample and at how many sites, have yet to be determined. In FY 03 we were funded under Project 03687 to outline a process whereby specific alternatives to monitoring are developed and presented to the EVOS Trustee Council for consideration. As part of this process, two key elements are required before reasoned decisions can be made. These are 1) a comprehensive historical perspective of locations and types of past studies conducted in the nearshore marine communities within Gulf of Alaska, and 2) estimates of costs for each element of a proposed monitoring program. We have developed a GIS database that details available information from past studies of selected nearshore habitats and species in the Gulf of Alaska and provide a visual means of selecting sites based (in part) on the locations for which historical data of interest are available. We also provide cost estimates for specific monitoring plan alternatives and outline several alternative plans that can be accomplished within reasonable budgetary constraints. The products that we will provide are 1) A GIS database and maps showing the location and types of information available from the nearshore in the Gulf of Alaska, 2) A list of several specific monitoring alternatives that can be conducted within reasonable budgetary constraints, and 3) Cost estimates for proposed tasks to be conducted as part of the nearshore program. Because data compilation and management will not be completed until late in FY03 we are requesting support for close-out of this project in FY 04.

STAC Recommendation

The proposal completes the process of understanding the data available to guide planning for nearshore monitoring under GEM by providing a report on the activities concluded in FY 03 Fund.

Executive Director's Recommendation

The proposal provides funding for close-out and reporting of project begun in FY 03 Fund.

Project ***Brown-Schwalenberg-FY04-Subsistence & Stewardship Gathering***

Project Title Subsistence and Stewardship Gathering Fifteen Years After the Spill

Location Village participants from PWS and Lower Cook Inlet will gather in Anchorage for GEM

Proposer Patty Brown-Schwalenberg **Proposer Affiliation** NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$31,250 00

FY05 \$0 00

FY06 \$0 00

Abstract

This project will support a GEM science symposium in commemoration of the 15th anniversary of the Exxon Valdez oil spill. The symposium will be held in Anchorage during the annual Gathering of Chugach region Tribes but it will include participants from all communities in the oil spill area. The goal of the symposium is to share information and improve communication between holders of traditional and scientific knowledge.

STAC Recommendation

The proposal is weak in providing any specifics of which scientists will attend, and how they are related to what projects or issues and how the symposium relates to GEM (other than community residents sharing information and communicating with scientists). The proposal does provide for a planning committee that will identify a “well-defined topic (related to subsistence use, TK, and GEM science projects)” as the focus of the agenda. The proposal is weak in its explanation of linkages between the gathering and “GEM studies” (long-term monitoring and ecosystem-based research). PAC should be involved in setting the topic for the symposium, which should not be the 15th anniversary of the oil spill. Proposal should be revised to provide more specifics of how the symposium will be related to GEM. Recommendation: Revised proposal providing more specific focus on GEM is needed. Fund contingent on receipt of revised proposal addressing reviewers concerns.

Executive Director’s Recommendation

The extent to which the Trustee Council may want to commemorate the fifteenth anniversary of the oil spill has not been determined. Proposal cannot move forward without this determination and a revision that focuses the content more clearly on the GEM program. Defer.

Project ***Brown-Schwalenberg-FY04-Tribal Involvement in the GEM Program***

Project Title Tribal Natural Resource Stewardship and Tribal Involvement in the GEM Program

Location N Gulf of Alaska, including PWS, Cook Inlet, Kodiak Island, and the Alaska Peninsula

Proposer Patty Brown-Schwalenberg **Proposer Affiliation** NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

In FY 04, this project will focus on three objectives (a) continuing coordination between the GEM program and tribal communities, ensuring that scientific goals and traditional/local knowledge is shared, (b) conducting a WisdomKeeper Series for discussing and sharing research and monitoring issues with selected biologists, scientists, elders, and traditional knowledge experts, and (c) providing training opportunities for resource specialists in oil spill communities through development of a training curriculum and providing travel to GEM workshops and scientific symposiums

STAC Recommendation

EVOSTC has funded this program for seven years and the proposal is seeking FY04 funds. The solicitation indicated “no new specific community involvement projects are being solicited with the exception noted below.” Exceptions: Small-scale science symposiums for smaller communities and coastal mapping. This proposal seems non-responsive to the solicitation (unless continuing projects are exempt) as it is neither a small-scale science symposium nor a coastal mapping project training curriculum to build technical capabilities of tribal specialists, and joins a larger capacity building grant. At one level, this proposal is responsive and provides assurances that its community involvement recipe is working well. On another level, the proposal does not provide any details on how it relates to long-term monitoring of specific variables associated with GEM. What have we learned from the ongoing tribal natural resource programs that can be used in GEM? What has been produced from the WisdomKeeper Series that can be applied to long-term monitoring? The community involvement represented in this proposal is not focused on developing long-term monitoring, but is centered on coordination, communication, and training. This may be very appropriate, but it should not be confused with community involvement with specific GEM monitoring projects. There was no formula in the proposal on how this project would work toward identifying community-based monitoring projects that respond to community concerns and work to implement long-term GEM monitoring. However, one-third of the budget (\$60,000) is for a Tribal Natural Resource Program Planner who oversees the EVOS Natural Resource Management and Stewardship Capacity Building Project and works with “tribes to develop means by which western science and TK can be jointly utilized in conducting research and monitoring activities and increase tribal involvement in all aspects of GEM.” \$180,000 represents over 7% of annual funding capacity for FY04 (based on \$2.5 M funding). Recommendation: Do Not Fund with suggestion that any future proposals need to be more specific toward GEM long-term monitoring goals.

Executive Director's Recommendation

The report on approaches to community involvement commissioned by the Trustee Council in FY 2003 will not be available until the end of September 2003. The report is expected to provide the basis for a thorough examination of the role of community involvement in the GEM program to be conducted by the Executive Director during FY 2004. Until that examination is complete, funding of community involvement projects will be based on responsiveness to the criteria in the FY 04 Invitation and past and future utility for implementing the GEM program. Based on an evaluation of the Tribal Natural Resource Management Plans produced under past years funding of this project, the lack of community-originated GEM projects resulting from past efforts of this project, the lack of connection to the GEM Science Plan, and the recommendations of the STAC, I cannot support this project. Do not fund.

Project *Cokelet-FY04-AK Marine Highway System Ferries*

Project Title Biophysical Observation aboard Alaska Marine Highway Systems Ferries

Location Alaska Coastal Current, Prince William Sound

Proposer Edward Cokelet

Proposer Affiliation NOAA

Lead Agency NOAA

Funding Recommendations

FY04 \$171,500 00

FY05 \$185,900 00

FY06 \$155,900 00

Abstract

The Alaska Coastal Current flows counterclockwise along the edge of the Gulf of Alaska carrying the river runoff, nutrients and plankton that fuel the productive coastal-marine ecosystem. As seen in satellite images, a strong “chlorophyll front” develops in summer between the nutrient-poor region to seaward and a productive region around Kodiak Island that extends northward to the Kenai Peninsula. Conventional wisdom predicts that the Gulf ecosystem should not be productive because the average wind pattern favors downwelling oceanic conditions that fail to restore nutrients to the sunlit upper layers. The chlorophyll front presents a natural study area over which low- and high-productivity regions lie in close proximity. The Alaska Marine Highway System ferry M/V *Tustamena* crosses this front over 280 times each year. We propose to instrument the *Tustamena* to measure physical and biological oceanographic parameters across the Alaska Coastal Current and in Prince William Sound. This will begin a GEM oceanographic monitoring program in the Gulf that will lead to understanding nutrient replenishment and document ecosystem trends for years to come.

STAC Recommendation

This is an excellent response to the GEM request for proposals to use State of Alaska ferries as platforms for collecting environmental observations. It requests a major commitment of funds, however the returns are commensurate with the costs. It should generate a working, robust system and a suite of data from tracks of maximum interest in the GEM target region, the oil spill trajectory. The M/V *Tustamena* is selected because it makes the maximum number of crossings each year of the ACC. The routes (mostly Kodiak-Homer and Kodiak-Seward) will cross the coastal to oceanic chlorophyll front and salinity gradient. It is proposed to follow, by and large, the recommendations of the PICES 2002 report on engine room instrumentation for VOS. A rather full installation is proposed for the ship's April yard period in 2004. A thermosalinograph to sample at the ship's sea chest is to be purchased and installed and backed up by hull conductance thermometry. Cokelet et al propose to loan the project fluorometry, transmissometry, colored dissolved matter spectrometry (CDOM) and automated nitrate analysis facilities in the first year, replacing them with project-purchased sensors in later years. Cokelet et al give evidence of experience dealing with ship operators concerning such installations, a key aspect of such projects worldwide. The STAC recommends that the investigators must accommodate the needs of the AMHS regarding in-ship communication. The proposers need to investigate the status of the meteorologic observations collected by the vessel. A wireless remote system is needed to collect these data. Two revisions are required, the real-time communication and costs should be eliminated from the proposal. The ADCP should be eliminated from this proposal because the information received is not proportional to the cost required. Fund contingent upon revised proposal with reduced instrumentation described above.

Executive Director's Recommendation

Agreement in principle has been reached with the AMHS engineering and operations staff concerned and a memorandum of agreement on the specifics of the project is in process. This agreement and project are historic milestones that provide for highly cost effective monitoring of the coastal environment of Alaska. Revised proposal addressed STAC recommendations. Fund

Project Cooper-FY04-Community-Based Sampling

Project Title Community-Based Sampling of Watershed-Based and Marine-Derived Nutrients, Submitted under the BAA

Location Kachemak Bay and Anchor, Kaslof and Kenai River watersheds

Proposer Joel Cooper

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$102,512 00

FY05 \$85,958 00

FY06 \$96,942 00

Abstract

In Southcentral Alaska, healthy watersheds support the region's economic, social and cultural well-being. Cook Inlet Keeper's community-based water quality monitoring program has proved to be an efficient and cost-effective way to collect important baseline data and increase public involvement in natural resource management. Keeper will coordinate with other groups conducting nutrient sampling throughout Southcentral Alaska and expand its community-based monitoring program to include watershed-based and marine-derived nutrient sampling to test the following hypotheses:

1) Certain nutrients, like ammonium, are useful proxies for determining levels of marine-derived nutrients in coastal watersheds, 2) Marine-derived nutrient levels in aquatic and riparian food webs vary seasonally related to salmon influx, 3) Community-based sampling of watershed-based and marine-derived nutrients is an efficient and cost-effective way to meet GEM research goals, increase public understanding of public resources, and promote sound resource management.

STAC Recommendation

This proposal is highly responsive to the Invitation. It proposes to expand a well established volunteer, community-based monitoring program (dating from 1996) to include watershed-based and marine-derived nutrient sampling to test three important but simple hypotheses. The proposal is well coordinated with other watershed projects and GEM proposals in the area (Mazumder, Walker-Heintz, EPA/DEC Citizens Environmental Monitoring Program). The program is nearly one-half funded from other sources. The program incorporates an ongoing community-based monitoring program that presumably reduces costs and strives to collect data toward GEM program hypotheses and questions. STAC recommends that authors submit a letter agreeing to implement recommendations of peer reviewers regarding sampling. The proposers should add a no-cost objective (in the letter) that expands the role of this project in coordinating other watershed projects. A watershed workshop will be held at the January 2005 GEM meeting. At that time the PIs on all watershed projects will present an up-to-date report and participate in comparison and evaluation of methods. Under the added role of coordinator, the PI will organize and facilitate the workshop. Expenses for the workshop, except PI's salary, will be paid separately by the GEM program. Fund contingent upon receipt of letter accepting these conditions.

Executive Director's Recommendation

The project is a good beginning for establishing a watershed sampling program for GEM that should be highly cost effective. It is community-based and well organized as a network of volunteers backed by scientists and a well equipped laboratory. Author provided letter addressing STAC recommendations. Fund.

Project ***Couvillion-FY04-Coordinated Coastal Mapping***

Project Title Coordinated Coastal Mapping

Location Entire GEM study area

Proposer Amalie Couvillion

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$98,500 00

FY05 \$0 00

FY06 \$0 00

Abstract

Interest in shoreline mapping within the oil spill area has increased in recent years, with the result that several shoreline mapping projects have been developed as pilot projects. In March, 2003, the EVOS Trustee Council convened a workshop with over twenty groups involved in shoreline mapping. The groups agreed to coordinate mapping efforts. This proposal evolved from the recommendations of that workshop. It solicits support for coordinating shoreline mapping efforts throughout the oil spill area. This proposal addresses the need for coordination in coastal mapping, rather than for collecting and ground-truthing new information (those specific work tasks will be developed and submitted by others). The key expected result from a well coordinated coastal mapping effort is a unified, seamless, ShoreZone map covering the entire GEM study area that will be electronically available to researchers, local governments, industry, and the general public.

STAC Recommendation

This project proposes to hire a Coordinator for Coastal Mapping that would be housed at The Nature Conservancy. The proposal is extremely well written and clearly spells out what the coordinator would do. This proposal is in direct response to a strong recommendation from the EVOS-sponsored Shoreline Mapping Workshop that was held in Anchorage in March 2003. I facilitated that workshop as a representative of EVOS. This proposal is not to do any shoreline mapping or to collect data, but rather it is to have one person who will coordinate all the projects that are collecting data. The problems and gaps that were discovered in the current process include the need for compatibility among projects, need for standard sampling protocol, need for development of strategy to fill physical gaps in coverage, plan for data management, and produce a unified ShoreZone map of the GEM area. The workshop strongly recommended that a Coordinator be hired to oversee these vital components. There was much discussion and concern that several projects are using a form of shoreline mapping, but that the results would not be compatible. The Shoreline Workshop specifically recommended that the coordinator position be housed in TNC. This position and proposal were not the idea or suggestion of TNC, but rather of the other workshop components. However, I am impressed with the PI's credentials and she would oversee the project and the Coordinator.

This project specifically addresses the Invitation Part A2 -- Nearshore Synthesis and B -- Data Management and IT. The technical merits of this proposal are excellent as it specifically addresses the needs, objectives and methods. The position would not be totally funded by EVOS, but rather TNC identifies matching funds for part of the salary for each of three years. Of course, the Workshop recommendation was that EVOS help support this project for the first year and

other funding to pay for it in the remaining years Fund

Executive Director's Recommendation

In March, 2003, the EVOS Trustee Council convened a workshop with over twenty groups involved in shoreline mapping. The groups agreed to coordinate mapping efforts. While this proposal is responsive to the recommendations of that workshop, more matching funding from other participants was expected. Even though it is important to GEM objectives to move forward on this project, fiscal constraints not foreseen at the time of the earlier fund recommendation have changed the recommendation on this project to deferral. Defer for FY 04 and invite a proposal next year for FY 05 and FY 06 that increases the financial contributions of other participants.

Project DeLorenzo-FY04-Youth Area Watch

Project Title Youth Area Watch

Location PWS, Kenai Peninsula

Proposer Richard DeLorenzo

Proposer Affiliation Local Government

Lead Agency ADFG

Funding Recommendations

FY04 \$121,100 00

FY05 \$126,400 00

FY06 \$133,200 00

Abstract

This project links students in the oil spill impacted area with research and monitoring projects funded by the Trustee Council and outside agencies. Youth conduct research identified and delegated by principal investigators who have indicated interest in working with students. The project involves students in the acquisition and monitoring of oceanographic and meteorological data over time. Students also develop a local restoration project, which provides them the skills to participate in community-based science. Youth Area Watch fosters long-term commitment to the goals set out in the restoration plan and is a positive community investment in that process. Participating communities in FY 04-06 will be Chenega Bay, Cordova, Seward, Tatitlek, Valdez and Whittier.

STAC Recommendation

The proposal is not responsive to the invitation even though it does seek community involvement. The proposal is weak in providing any linkages to GEM long-term-monitoring program. This past restoration projects may or may not be appropriate for GEM monitoring. The proposal seems to contain a large amount of text from the previous restoration-oriented youth area watch proposals with occasional insertions of "GEM." In part, the program is dependent on principal investigators who are interested in working with students rather than focused on GEM goals. Furthermore, there is no indication of whether the student developed projects will relate to GEM. In fact, the proposal states that "students also develop a local restoration project, " It may be time to rework this Youth Area Watch project to make it more responsive to GEM goals and objectives. Recommendation: Do Not Fund.

Executive Director's Recommendation

The report on approaches to community involvement commissioned by the Trustee Council in FY 2003 will not be available until the end of September 2003. The report is expected to provide the basis for a thorough examination of the role of community involvement in the GEM program to be conducted by the Executive Director during FY 2004. Until that examination is complete, funding of community involvement projects will be based on responsiveness to the criteria in the FY 04 Invitation and past and future utility for implementing the GEM program. Unlike the Kodiak Youth Area Watch proposal, the PWS YAW proposal is not well grounded in the principles of the GEM program and shows a lack of understanding of the concepts of the need for community involvement in long-term monitoring programs. Based on the lack of connection to the GEM Science Plan, and the recommendations of the STAC, I cannot support this project. Following a recommendation of the PAC, the PI is invited to join the Executive Director during FY 2004 in exploring ways to re-constitute the PWS YAW program to be responsive to the GEM program, consistent with emerging community involvement guidelines. Defer.

Project **Devens-FY04-PWSRCAC-EVOS long term program**

Project Title PWSRCAC - EVOS Long Term Environmental Monitoring Program - Submitted under BAA

Location Prince William Sound, Kodiak, Kenai Peninsula

Proposer John Devens **Proposer Affiliation** NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$141,700 00

FY05 \$0 00

FY06 \$0 00

Abstract

The Prince William Sound Regional Citizens' Advisory Council/Exxon Valdez Oil Spill Trustee Council Long Term Environmental Monitoring Program provides essential long term baseline measurements of hydrocarbon levels and sources at program sites within areas of the Prince William Sound, Kenai Peninsula, Kodiak, and Gulf of Alaska. The program objective is to provide a program for the collection of baseline data in mussel tissue and subtidal sediments that can be used to determine impacts of oil sources on the ecosystem. This program will provide an improved link to recovery status and greater efficiency in hydrocarbon sampling and analysis that has been on going since 1993 under the auspices of PWSRCAC.

STAC Recommendation

Project was funded in FY 03 to evaluate potential of incorporation of existing PWS RCAC monitoring sites into the GEM program. Partnership with RCAC for nearshore sampling is highly desirable and advantageous to both organizations. Future funding is based on evaluation of FY 03 results in terms of the number and location of sites relevant to the GEM program. Do not fund.

Executive Director's Recommendation

An evaluation of the work conducted during FY 03 is needed in order to fully define how PWSRCAC and GEM can best collaborate on developing a long term nearshore monitoring program. PWSRCAC staff is invited to join with EVOSTC staff and subcommittees to develop this relation during FY 2004. Defer.

Project Eckert-FY04-Natural Variability in the Nearshore

Project Title A Synthesis of Natural Variability in the Nearshore Can We Detect Change?

Location Alaska (Synthesis)

Proposer Ginney Eckert

Proposer Affiliation Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$36,300 00

FY05 \$17,500 00

FY06 \$0 00

Abstract

One of the primary goals of the GEM program is to detect anthropogenic changes within the four focal habitats in the Gulf of Alaska, however natural variability in these systems can be so high that it prevents detection of human-induced effects. The goal of this proposal is to synthesize existing data to identify, within the nearshore habitat, environments and species that have less natural variability so that these variables can be included in the GEM monitoring plan. Data will be synthesized from the Gulf of Alaska and across a broad range of geographic areas to identify general characteristics that predict lower levels of natural variability in nearshore marine populations. The principal investigator is well suited to conduct this analysis because she was a coauthor of the current GEM nearshore monitoring plan, and she has conducted extensive analyses of natural population variability in nearshore organisms.

STAC Recommendation

This proposal provides a badly needed integrative service. The right person doing the right thing Fund.

Executive Director's Recommendation

The project provides synthesis in an important habitat type, the nearshore, at a critical time. The nearshore is closer to establishing a comprehensive monitoring program than other habitat types, so synthesis is particularly important in the nearshore habitat type. Fund.

Project **EVOS TC-FY04- Data System**

Project Title Gulf Ecosystem Monitoring and Research Program Data System

Location

Proposer EVOS TC EVOS TC

Proposer Affiliation

Lead Agency

Funding Recommendations

FY04 \$156,800 00

FY05 \$0 00

FY06 \$0 00

Abstract

This project will provide continuing funding for ongoing development of the data management and information transfer system for the Gulf of Alaska Ecosystem Monitoring and Research (GEM) program. GEM is designed to monitor the ecosystems of the northern Gulf of Alaska and adjacent coastal regions for a very long time period (more than 100 years). Data collection, quality control and documentation, archiving, transfer, delivery, and presentation are critical components of GEM. Project funding will allow the GEM Data Systems Manager to provide the leadership and expertise necessary for this essential part of the GEM program, and hire support staff to make initial aspects of the program operational.

STAC Recommendation NA

Executive Director's Recommendations NA

Project **EVOS TC-FY04-ARLIS**

Project Title Alaska Resources Library & Information Services (ARLIS)

Location

Proposer EVOS TC

Proposer Affiliation

Lead Agency

Funding Recommendations

FY04 \$160,900 00

FY05 \$0 00

FY06 \$0 00

Abstract

Project 040550 represents the Trustee Council's contribution to Alaska Resources Library and Information Services (ARLIS). ARLIS serves as the central access point for information generated through the Trustee Council restoration process and the GEM program. In addition, ARLIS is the public repository for reports and other materials generated from and related to the cleanup, damage assessment, and restoration efforts following the Exxon Valdez oil spill (EVOS). ARLIS supports the research efforts and information needs of the Trustee Council Office, principal investigators, natural resources professionals, and the general public. The Council has contributed budgetary support for ARLIS since the library was established in 1997. ARLIS is providing services that were previously provided through the Oil Spill Public Information Center (OSPIC). With the exception of Fiscal Year 1994, this activity has historically been funded under the Public Information, Science Management and Administration Budget (Project /100). Funding as a separate project began in Fiscal Year 2001, as Project 01550.

STAC Recommendation *NA*

Executive Director's Recommendations *NA*

Project *EVOS TC-FY04-Project Management*

Project Title EVOS TC Project Management

Location

Proposer EVOS TC

Proposer Affiliation

Lead Agency

Funding Recommendations

FY04 \$140,000 00

FY05 \$0 00

FY06 \$0 00

Abstract

Project management supports those Trustee agencies that administer and/or implement EVOS projects on behalf of the Trustee Council. Tasks performed by project managers include coordinating activities between principal investigators and the Trustee Council Office, reviewing project expenditure activity, assisting in the development of project proposals, and tracking project reports. This is a close out for this project as program management needs will be met from other sources in FY 2005.

STAC Recommendation *NA*

Executive Director's Recommendations *NA*

Project EVOS TC-FY04-Public Information and Administration

Project Title Public Information and Administration

Location

Proposer EVOS TC

Proposer Affiliation

Lead Agency

Funding Recommendations

FY04 \$863,300 00

FY05 \$0 00

FY06 \$0 00

Abstract

Project 040100 provides overall support for public and community involvement and administration of the Trustee Council programs through the Trustee Council office. This includes funding support for the staff working at the direction of the Trustee Council through the Executive Director, as well as public involvement efforts including the participation of the 20 member Public Advisory Committee (PAC).

STAC Recommendation NA'

Executive Director's Recommendations NA

Project EVOS TC-FY04- Scientific Management

Project Title Scientific Management under GEM and Lingering Oil Program

Location

Proposer EVOS TC

Proposer Affiliation

Lead Agency

Funding Recommendations

FY04 \$391,600 00

FY05 \$0 00

FY06 \$0 00

Abstract

This project will provide scientific oversight of the Gulf of Alaska Ecosystem Monitoring and Research (GEM) program and of lingering effects of oil on injured resources. Implementation will be based on the GEM Program Document (GPD), which describes how a network of monitoring and supporting activities will be implemented over a five-year period that started in FY 03 using synthesis, research, and modeling, and how the results will be captured and communicated through data management and information transfer. In FY 04, the project will support the Scientific and Technical Advisory Committee (STAC), three GEM subcommittees (habitat, data management and lingering oil), four workshops for developing GEM and other aspects of the scientific review process, provide peer review recommendations and scientific support for the existing Work Plan, Annual Reports and Final Reports, develop the FY05 Invitation to Submit Proposals, continue developing a "State of the Gulf Report" and provide regional input to a status report on North Pacific resources now being developed by PICES.

STAC Recommendation NA

Executive Director's Recommendations NA

Project *Fall-FY04-Status of Subsistence Uses*

Project Title Update of the Status of Subsistence Uses in Exxon Valdez Oil Spill Area Communities

Location Prince William Sound, Kodiak, Kenai Peninsula, and Alaska Peninsula

Proposer James Fall

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$298,700 00

FY05 \$25,600 00

FY06 \$0 00

Abstract

The project will provide information for an update of the status of subsistence uses in the Exxon Valdez oil spill area. Subsistence uses are a vital natural resource service that was injured by the spill and has not recovered. The project will be a partnership between the Alaska Department of Fish and Game, the Chugach Regional Resources Commission, the Kodiak Area Native Association, and the Bristol Bay Native Association. In early 2004 local research assistants and department researchers will interview face-to-face approximately 760 households in 14 communities about their subsistence activities in 2003. The questionnaire will be similar to that used in previous rounds of interviews. A planning workshop and data review workshop will be held involving study community representatives. A database with study findings and a final report will be produced. Training of local researchers and capacity building are key goals of the project.

STAC Recommendation

The last subsistence survey in spill affected communities was 1998. The project proposes to survey 760 HH in 15 communities related to 2003 subsistence activities. The project would be a collaborative effort between ADF&G, Division of Subsistence, CRRC, KANA, BBNA, and the communities. A key project goal is training local researchers in survey administration and data entry and review. The project design, including goals, sampling and survey methods, data analysis and statistical methods, are sound. The proposal incorporates community involvement in most stages of the project (except data analysis). The schedule is reasonable and the qualifications of the ADF&G Division of Subsistence are high. The proposal is responsive to the invitation (community involvement) and specifically responds to invited proposals under Lingering Oil Effects (collect, analyze and report information about current subsistence uses in a subset of oil spill area communities using methodology that is comparable with previous research results). Fall (ADF&G Division of Subsistence) was the PI for most of the previous research. The proposal is consistent with GEM strategies (incorporate community involvement and local knowledge) and goals (detect change, provide information to facilitate understanding of causes of change). The proposed project is part of a long-term monitoring of subsistence activities in the communities affected by the oil spill and includes both restoration and monitoring goals. Fund.

Executive Director's Recommendation

In the last survey of subsistence uses in 1998 it was found that this injured service had not recovered to pre-spill levels. A follow-up survey to assess the status of recovery is needed. Fund.

Project *Finney-FY04-Marine-terrestrial Linkages*

Project Title Marine-terrestrial Linkages in northern GOA Watersheds Towards Monitoring the effects of Anadromous Marine-derived Nutrients on Biological Production

Location Karluk Lake, Spiridon Lake, Kodiak, Alaska

Proposer Bruce Finney

Proposer Affiliation Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$79,197 00

FY05 \$80,154 00

FY06 \$81,117 00

Abstract

The proposed project is a comprehensive study examining the role of marine-derived nutrients (MDNs) in the productivity of a sockeye nursery lake ecosystem. The research plan integrates studies of nutrient cycling, primary productivity, zooplankton dynamics, and juvenile sockeye abundance and growth, within a framework of stable isotope natural abundance. The study sites are an ideal pair, very similar in characteristics except for access by spawning salmon (anadromous Karluk Lake and control Spiridon Lake). The project will take advantage of the wealth of previous research including relatively long-term limnological data for both sites. Based on previous work, signals from MDNs are anticipated to be relatively strong, which will help elucidate nutrient pathways. The research design is the first to utilize detailed vertical and temporal sampling of the water column, coupled with measurements of rates of primary productivity, and fully integrated stable isotope analyses, with contemporaneous sampling in a well-matched pair of salmon and control lakes. The overall goal of this project is to provide the framework for designing monitoring projects to detect changes in marine terrestrial linkages in Gulf of Alaska sockeye.

STAC Recommendation

This is a proposal to partner with a resource management agency (see Honnold) to understand the influence of marine derived nutrients in a comparison of two watersheds. This proposal covers project design, stable isotope measures and nitrate chemistry, and the partner proposal covers limnology, logistics, and sampling personnel. The proposals together evaluate several indicators of marine linkages across species and two distinct watersheds in close cooperation with a natural resource management agency. The proposal has several unique advantages, 1) a pair of similar lakes with and without apparent marine connections, 2) one lake has very long time series of data on fish abundance and stable isotope levels, 3) both lakes have good baseline data on limnological properties such as nutrients, primary productivity and euphotic volume, and 4) one lake has authoritative peer reviewed publications by one of the PI's that support the basic concepts of the proposal. The proposal would develop a strong partnership between university based researchers and a state agency (ADF&G) that would provide information useful to natural resource managers. State agency has close links to the local community and other government agencies. Prospects are good for learning how to measure and interpret linkages of coastal (oligotrophic) lake systems to the marine environment in the Gulf of Alaska in ways that will have practical applications of very large potential significance. Fund

Executive Director's Recommendation

Proposal provides an important comparison between salmon and non-salmon bearing lakes in the oil spill affected area that is important to establishing GEM watershed monitoring. PI's submitted an e-mail agreeing to participate in a watershed workshop will be held at the January 2005 GEM meeting, and to present an up-to-date report on progress and participate in comparison and evaluation of methods. Fund

Project Foster-FY04-Community Science Dialogues

Project Title Community Science Dialogues

Location Lower Cook Inlet and Kachemak Bay

Proposer Rick Foster

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

Effective stewardship of resources requires access to reliable information. The communities of Port Graham and Seldovia have demonstrated a desire to learn more about research occurring in their region. Kachemak Bay Research Reserve (KBRR) will partner with these villages to provide Community Science Dialogues (Dialogues). The Dialogues will be based on interests of the Villages and work of scientists researching various aspects of the oceanic, benthic, atmospheric, and watersheds of Kachemak Bay, Lower Cook Inlet, and Gulf of Alaska. Dialogues will build on the successful KBRR Science Seminar Series. Dialogues will feature a scientist and a local holder of traditional ecological knowledge on the subject, will introduce Port Graham's Community Research Protocols & Guidelines, and include opportunity for proposing and planning related community-based research projects. Three different formats will be evaluated with design and presentation protocols developed to aid scientists "inform and involve" communities in dialogue and project planning.

STAC Recommendation

Although the proposal is responsive to the invitation (small-scale science symposium/community involvement) and is consistent with one of the GEM strategies (incorporate community involvement and local knowledge), it falls short in a number of key areas. Methods are too narrow, and would need to be revised to expand the independent variable(s) beyond the process by which the scientists are chosen and prepared, to evaluate how variation in the dialogue process itself. Although the "Community Science Dialogues" method has been ongoing for a decade, the revision needs to present information on what has or what has not been effective. Recommendation: Do not fund.

Executive Director's Recommendation

The proposal did not establish the need for its activities in a compelling way, and the methodological difficulties identified by the peer review are substantial. Do not fund.

Project **Guay-FY04-Assessing Watershed**

Project Title Assessing Watershed Source of Metals to Coastal Environments in the vicinity of Kachemak Bay

Location Kachemak Bay, southern Kenai Peninsula

Proposer Christopher Guay

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

Samples of water, suspended particulates, surface sediments, and benthic organisms will be collected from watershed/estuary systems on the southern Kenai Peninsula in the vicinity of Kachemak Bay. Samples will be collected over a two-year period starting in December 2003. Much of the sampling will be conducted by residents of Seldovia, Port Graham, and Nanwalek after training at the beginning of the project in October 2003. The samples will be analyzed for a suite of metals (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Zn) by ICPMS, and the data will be used to address the following hypotheses related to the cycling of metals in these environments:

1. The watersheds are a significant source of metals to adjacent coastal areas
2. Contributions of metals by marine source waters are small relative to inputs of metals from the watersheds
3. Metals accumulate in sediments and biota in the coastal areas adjacent to the watersheds

STAC Recommendation

This proposes to sample for naturally occurring metals in water and sediments in Kachemak Bay and the Kenai Peninsula. There are indications that metals may be accumulating in seafood consumed in this region. This is a well-written proposal that has methods clearly laid out and has a good field sampling plan covering time and space. Additionally, this proposal directly involves local communities with collecting the samples and would work closely with other separately funded programs. The measurement of terrestrial-marine linkages is ultimately of interest to the GEM program because of the need to understand the basis for changes in production of birds, fish and mammals in the oil spill affected areas. The proposal does not address terrestrial marine linkages that in the long-term shed light on production or productivity in the GEM area. As such the proposal is not responsive to the Invitation for FY04. The Invitation (pp 11-12) specifically asked for programs to identify, evaluate and implement sampling strategies for marine signals. This proposal is for a specific sampling strategy for specific freshwater signals (metals) that have not yet been identified as something that needs to be monitored. While the sample design of the project is good, it makes the project extremely expensive. The proposed project is further ahead than GEM is at this moment and GEM is not yet prepared to fund a full-scale sample plan without more investigation into the design of the plan on a GEM region-wide scale. This is not something that would lead to a long-term monitoring project for GEM. This aspect makes the proposal unfundable at this time. Do not fund.

Executive Director's Recommendation

Although the topic of heavy metal contamination in coastal sea foods is of interest to coastal communities, the proposal did not establish a compelling need for this investigation in relation to the Invitation for Proposals. Do not fund.

Project Heintz-FY04-Energy Allocation

Project Title The Influence of Adult Salmon Carcasses on Energy Allocation in Juvenile Salmonids

Location Kenai Peninsula

Proposer Ron Heintz

Proposer Affiliation NOAA

Lead Agency NOAA

Funding Recommendations

FY04 \$48,400 00

FY05 \$42,300 00

FY06 \$14,100 00

Abstract

This proposal seeks to examine the effect of adult salmon carcasses on the energy allocation in juvenile salmon. Juvenile salmon allocate energy between the competing demands of growth and energy storage to minimize exposure to predation while forestalling starvation over winter. This proposal will contrast annual energy dynamics in age-0 Dolly Varden from Kenai Peninsula streams with and without salmon carcasses present. Fatty acid analysis will be used to identify marine signal strength and persistence in the lipids of the juveniles. The investigators will combine proximate and lipid class analyses to determine the proportions of their total energy allocated to storage versus structure, and examine how seasonal variation in allocation differs among streams and carcass densities. They also will examine the influence of carcasses on growth rate and the relation between growth and energy allocation.

STAC Recommendation

Responds to watershed invitation. Provides novel approach to measuring the effects of MDN on resident freshwater species and juvenile salmon in partnership with other proposal (Walker). The GEM program identifies a need for indicators that show how and when to measure marine-related biological production in watersheds. Results from this study will provide additional information about the efficacy of changes in the intensity of the marine signal and lipid reserves between fall and spring as a tool for monitoring the impacts of marine nutrients on the production and survival of juvenile. Potential direct application to fishery management through understanding of factors contributing to year class strength in resident species (growth and over winter survival). Such a tool would have wide application for management of salmon and salmon spawning habitat in the state. Fund contingent.

Executive Director's Recommendation

Proposal provides a desirable resource management dimension to the watershed study of Walker, however outstanding reports from the PI need to be submitted. PI agreed to participate in a watershed workshop will be held at the January 2005 GEM meeting, and to present an up-to-date report on progress and participate in comparison and evaluation of methods. Fund contingent on receipt of review drafts of all outstanding reports.

Project *Honnold-FY04-Marine-derived Nutrients on Sockeye Salmon*

Project Title Monitoring the Effects of Anadromous Marine-derived Nutrients on Sockeye Salmon

Location Kodiak Island, Alaska

Proposer Steve Honnold

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$83,200 00

FY05 \$82,400 00

FY06 \$86,800 00

Abstract

We propose to comprehensively examine the role of MDN in sockeye salmon nursery lake ecosystem productivity by integrating studies of nutrient cycling, primary productivity, zooplankton dynamics, and juvenile sockeye abundance and growth, within a framework of stable isotope natural abundance. The project will take advantage of previous research including relatively long-term limnological data for Karluk Lake on Kodiak Island. We will utilize detailed vertical and temporal sampling of the water column, coupled with measurements of rates of primary productivity, and fully integrated stable isotope analyses, with contemporaneous sampling in a well matched pair of salmon (Karluk) and control (Spiridon) lakes. We propose to determine the extent to which the functioning and productivity of watersheds depends on marine-nutrient inputs and how this marine-terrestrial linkage can be better detected and understood. The overall goal of this project is to provide the framework for designing monitoring projects to detect changes in marine terrestrial linkages in Gulf of Alaska sockeye watersheds.

STAC Recommendation

This proposal is from a state agency to partner with university based expertise (see Finney) to understand the influence of marine derived nutrients in a comparison of two watersheds. This proposal covers limnology, logistics, and sampling personnel and the university proposal covers overall project design, stable isotope measures and nitrate chemistry. The proposals together evaluate several indicators of marine linkages across species and two distinct watersheds in close cooperation with a natural resource management agency. The proposal has several unique advantages, 1) a pair of similar lakes with and without apparent marine connections, 2) one lake has very long time series of data on fish abundance and stable isotope levels, 3) both lakes have good baseline data on limnological properties such as nutrients, primary productivity and euphotic volume, and 4) one lake has authoritative peer reviewed publications by one of the PI's that support the basic concepts of the proposal. The proposal would develop a strong partnership between university based researchers and a state agency (ADF&G) that would provide information useful to natural resource managers. State agency has close links to the local community and other government agencies. Prospects are good for learning how to measure and interpret linkages of coastal (oligotrophic) lake systems to the marine environment in the Gulf of Alaska in ways that will have practical applications of very large potential significance. Fund

Executive Director's Recommendation

Proposal provides an important comparison between salmon and non-salmon bearing lakes in the oil spill affected area that is important to establishing GEM watershed monitoring. PI agreed to participate in a watershed workshop, which will be held at the January 2005 GEM meeting, and to present an up-to-date report on progress and participate in comparison and evaluation of methods. Fund

Project *Irons-FY 04-Bird Abundance in PWS*

Project Title Surveys to Monitor Marine Bird Abundance in Prince William Sound during Winter and Summer 2004

Location Prince William Sound, Alaska

Proposer David Irons

Proposer Affiliation DOI

Lead Agency DOI

Funding Recommendations

FY04 \$175,518 00

FY05 \$0 00

FY06 \$0 00

Abstract

We propose to conduct small boat surveys to monitor abundance of marine birds and sea otters (*Enhydra lutris*) in Prince William Sound, Alaska during March and July 2004. Seven previous surveys have monitored population trends for >65 bird and 8 marine mammal species in Prince William Sound after the Exxon Valdez oil spill. We will use data collected in 2004 to examine trends from summer 1989-2004 and from winter 1990-2004 by determining whether populations in the oiled zone changed at the same rate as those in the unoiled zone. We will also examine overall population trends for the Sound from 1989-2004. Due to the lack of data prior to the Exxon Valdez oil spill, continued monitoring of marine birds and sea otters is needed to determine whether populations injured by the spill are recovering. Data collected in 2000 indicated that bald eagles (*Haliaeetus leucocephalus*) are increasing in winter and summer throughout Prince William Sound, harlequin ducks (*Histrionicus histrionicus*) are increasing in the oiled area in winter, and black oystercatchers are increasing throughout Prince William Sound in summer. Numbers of all other injured species are either not changing or are declining in the oiled area. Common loons (*Gavia immer*), cormorants (*Phalacrocorax* spp.), and common murrelets (*Uria lomvia*) are showing no trend in the oiled area, pigeon guillemots (*Cepphus columba*) and marbled murrelets (*Brachyramphus marmoratus*) are declining in the oiled areas of Prince William Sound and Kittlitz's Murrelet (*Brachyramphus brevirostris*) is declining throughout Prince William Sound. Results of these surveys up through 1998 have been published by Irons et al. (2000) and Lance et al. (2001). Analyses of these survey data are the only ongoing means to evaluate the recovery of most of these injured species. A Final Report will be written upon completion of the project that will address population status of species observed during the survey.

STAC Recommendation

This proposal would continue a systematic survey by boat of birds and sea otters in PWS. There is an established standard methodology for these surveys. These surveys go back to the mid-1970s and provide some of the few quantitative data sets for animal populations from before the spill. Starting in the mid-1990s these surveys were carried out every 3 years and the present proposal is for continuation of this series. Aside from their value in understanding whether post-spill populations of sea birds in PWS are attaining pre-spill levels, the survey results now constitute one of the few long-term data sets for sea birds in the northern GOA. It also includes many species that are not otherwise measured in other censuses of sea birds. The proposed work therefore constitutes a valuable addition to the FY04 work plan both as follow up on the spill injury to birds, which was extensive, but also as a valuable data set for addressing GEM goals relative to shifting animal populations. Fund

Executive Director's Recommendation

The project adds another point in an increasingly valuable time series of sea bird population abundance in the areas of the spill. The need to survey bird populations to assess recovery status is well justified, as several injured bird species have not shown signs of recovery since the spill. Fund

Project ***Irvine-FY04-Lingering Oil on Boulder-Armored Beaches***

Project Title Monitoring Lingering Oil on Boulder-Armored Beaches in the Gulf of Alaska

Location Kenai Peninsula, Alaska Peninsula

Proposer Gail Irvine

Proposer Affiliation DOI

Lead Agency DOI

Funding Recommendations

FY04 \$71,700 00

FY05 \$17,200 00

FY06 \$0 00

Abstract

We propose to continue monitoring the persistence and degradation of oil at boulder-armored Gulf of Alaska beaches that have been studied since 1992 and investigate how stability of the boulder armors affects both persistence and weathering. These sites were re-sampled in 1994 and 1999, 2004 would be the next targeted study date. The continued contamination of these sites, arrayed along the Katmai and Kenai Fjords National Park coasts, compromises the aesthetics and wilderness values of some of the most pristine wilderness-coast parklands in the world. The lack of weathering of much of the oil means that the oil, if released, could pose a risk to biota. Subsurface oil persisted at these sites in 1999 with little change in extent or chemical weathering since 1994. Data also suggests that the boulder armors are largely stable. We propose to assess changes in surface and subsurface oiling, chemical weathering of the oil, and stability of the boulder armors. Results will be published.

STAC Recommendation

This proposal directly addresses the question of the persistence of oil on armored gravel beaches outside of PWS 15 years after the spill. This survey has been carried out several times at various intervals after the spill. It is important to extend this study one more time to understand the larger geographic picture of oil persistence subsurface in beaches long after the floating oil and oil on beaches has disappeared from view. The extent and degree of oil weathering are both addressed. The reviewer had some suggestions for changes in the proposed work, particularly in the area of geomorphology, which should be addressed before the work is carried out in FY 04. The work also needs to be coordinated with and made consistent with shoreline mapping efforts. Defer contingent on publication of results of past studies and receipt of revised proposal addressing peer reviewer concerns and the recommendation of the November 2003 work shop on lingering oil.

Executive Director's Recommendation

The specific requirements for further work on lingering oil need to be further developed during a workshop to be conducted in November 2003, and publication of results of past work in this area are needed before this project can proceed. Defer.

Project Jack-FY04-Sea Otter Abundance

Project Title Unalaska, Ouzinkie, Kamishak Bay and Kachemak Bay Local Sea Otter Abundance Trend Survey Project

Location

Proposer Lianna Jack

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

Sea otters (*Enhydra lutis*) west of Cook Inlet, including the Barren Islands, have been designated as a candidate species under the Endangered Species Act. This determination is based on a limited number of aerial surveys. This limited data provides no indication of current sea otter population trend, whether sea otter populations have stabilized, are increasing or are decreasing. The Alaska Sea Otter and Steller Sea Lion Commission (TASSC) proposes annual sea otter trend surveys for three years to be conducted in four areas within Southwest Alaska. Specifically, we propose to work with the Tribal Governments of Unalaska and Ouzinkie, and to monitor Kamishak and Kachemak Bays to determine sea otter population trend.

STAC Recommendation

This proposal seeks funding to conduct annual sea otter trend surveys for three years in four areas within southwest Alaska: Unalaska, Ouzinkie, Kamishak Bay, and Kachemak Bay. Sea otters west of Cook Inlet, including the Barren Islands, have been designated as a candidate species under the Endangered Species Act. The determination was based on a limited number of aerial surveys by the U.S. Fish and Wildlife Service (USFWS). The project is a collaboration of Alaska Native communities under the direction of the Alaska Sea Otter and Steller Sea Lion Commission. The proposed monitoring will utilize local expertise through implementation of skiff surveys in four areas. The proposal is not clear on how the monitoring work will complement ongoing and future surveys conducted by the USFWS. The proposal needs to be enhanced to reflect cooperation with the federal management agency. Also, the proposal needs to reflect what, if any, cost sharing the USFWS may provide to help complete the project. The project is non-responsive to the Invitation, is largely out of the GEM area and does not coordinate with the federal agencies. Do not fund.

Executive Director's Recommendation

The proposal calls for work in areas well outside the oil spill affected area, and on an injured species, the sea otter, in areas that are well outside the locales now demonstrating lingering oil effects. Such a survey in the oil spill affected areas may be indicated once long-term monitoring objectives have been established for the nearshore habitat type, however it is not responsive to our needs at this time. Do not fund.

Project *Kiefer-FY04-Alaskan Groundfish Feeding Ecology*

Project Title Alaskan Groundfish feeding Ecology An OBIS Information System

Location GOA, Aleutian Islands, Bering Sea

Proposer Dale Kiefer

Proposer Affiliation Private Enterprise

Lead Agency NOAA

Funding Recommendations

FY04 \$80,900 00

FY05 \$0 00

FY06 \$0 00

Abstract

We propose to develop an OBIS data server node containing information characterizing the distribution and feeding ecology of Alaskan groundfish in relation to environmental parameters. Capitalizing upon our experience as participants in several OBIS projects and using established OBIS tools and protocols for Web-based access to biogeographic datasets, this information system will archive, analyze, and provide a means to distribute via the Internet information on the spatial and temporal distribution of a large number of groundfish and associated prey species sampled in the Gulf of Alaska, Aleutian Island waters, and the Bering Sea by NMFS Alaska Fisheries Science Center (AFSC). This biogeographic information system will include data on the gut contents of specimens as well as environmental information characterizing the habitats of the species. These datasets provide a biogeographic description of groundfish distribution and dynamics in relation to habitat structure and environmental variability. They also provide a detailed account of interspecific and environmental interactions that are integral to ecosystem-based fisheries assessment and management approaches. Biological databases used in this project will derive from AFSC, while environmental information will come from databases at the Pacific Marine Ecological Laboratory, AFSC and other sources such as the Institute of Marine Science, University of Alaska Fairbanks. Datasets employed are diverse in nature, and will include satellite imagery, hydrographic and fishery surveys data. The information system will address the problem of integrating multivariate data that has been collected on differing spatial and temporal scales. It will also provide GIS tools to analyze, visualize, and disseminate information according to OBIS technical protocols. Our goal is to develop a pilot system that will not only augment OBIS, but also characterize the habitat and behavior of Alaskan groundfish, and provide a model of how the integration of environmental information can aid in the assessment of marine resources.

STAC Recommendation

This proposal provides a structured proven approach to the implementation of an OBIS (Oceanographic Biological Information System) node in the Alaskan region in addition to addressing the invitation very well. Kiefer has chosen the Alaska Fisheries Science Center Groundfish Databases as a candidate series of datasets to be upscaled into the Census of Marine Life's (CoML) bio-geographic database schema known as OBIS. Four dimensional (x,y,z,t) visualization tools will be accessible through the web or client connection using EASy WEB Server or EASy client respectively. EASy is a product which has been developed by Kiefer and has been integrated with many regional observing systems such as the Gulf of Maine Biological Information System (GIMBIS) and has been ported to the DODS server (a product of the OPeNDAP Group). In addition to providing GEM with a regional OBIS node, this proposal will

also assist in the initialization of the Alaskan Oceanographic Observing System (AOOS) by providing a data node which will pipe information to the national level (IOOS). Focus the demonstration on the geographic region of the GEM Program. The Alaska Groundfish data set is only a starting point for implementation, and the extension to more GEM-relevant data sets such as SEA, APEX, NVP, is recommended for the future. Interactions with potential users, such as the GEM modeling group, the authors of GEM synthesis sections, and interested members of the public. Fund

Executive Director's Recommendation

The proposal takes a big step toward meeting GEM needs for database standards, and for improving access of scientists and the public to GEM data, as well as to GEM related data. The use of the groundfish database is justified because it saves development costs by providing a well known standard against which results may be judged. Once the proof of concept is established, the products from the project are extensible to many different types of data at small marginal cost. Fund

Project **Kline-FY04-Exchange between GOA and PWS**

Project Title Detecting the Exchange between Gulf of Alaska and Prince William Sound,
Submitted under the BAA

Location Prince William Sound

Proposer Thomas Kline

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$142,800 00

FY05 \$189,300 00

FY06 \$193,500 00

Abstract

This project will use stable isotope analysis to understand how exchange between the Gulf of Alaska (GOA) and Prince William Sound (PWS) via the Alaska Coastal Current affects the biology of PWS through assessment of the influx of diapausing *Neocalanus* copepods, the keystone zooplankton taxon of the subarctic Pacific, from the GOA in the Black Hole of PWS. The project will first resolve the hypothesized summer timing of the *Neocalanus* inflow using MOCNESS samples from the PI's GLOBEC project during cruises in 2001 to 2004. During the fall-winter of 2004-2005 the project will determine how best to assess net inflow with the minimal number of sampling stations. During the fall-winter 2005-2006 the project will begin to assess stage timing and population dynamics of diapausing and reproducing *Neocalanus* so as to lead to monitoring and predictive modeling. The project will recommend a sampling strategy for long-term sampling to monitor changes in the nature of the GOA inflow through impacts on this key taxon.

STAC Recommendation

Understanding exchanges between PWS and the Gulf of Alaska is surely important to GEM, however the proposal does not clearly explain *Neocalanus* life histories and the theory of stocking of the PWS "Black Hole" with diapausing individuals from the GOA. The text is not clearly written. The sampling methods are not the best for the species in question. Zooplankton sampling in the Black Hole is ideally suited to the simplest sorts of messenger activated vertical nets. A cast to 800 m can be made in half an hour or less, a complete vertical series in 2 to 3 hours. Therefore the proposal to acquire and use a HydroBios Multnet is wasteful and likely to reduce the overall reliability of the sampling scheme. For purposes of knowing how many diapause stage *Neocalanus* are in the Black Hole on a given date, no closing nets are needed, but rather a vertical haul from just over the bottom to the surface and report the result as number m-2. It will take a modest boat with a davit or A-frame, and a powered winch with 1000 m of wire rope, as opposed to the more expensive platform proposed here. It is not explained why GEM should bear the cost of working up GLOBEC samples, although this may be justified under certain circumstances. Do not fund.

Executive Director's Recommendation

The proposal identifies a very important area of information for the GEM program. Correspondence with the author indicates that methodological problems identified in the peer review may be resolved during the current funding cycle. Defer.

Project *Knudsen-FY04-Nutrient-Based Resource Management*

Project Title Research for Nutrient-Based Resource Management in Watersheds and Estuaries

Location Prince William Sound

Proposer Eric Knudsen

Proposer Affiliation DOI

Lead Agency DOI

Funding Recommendations

FY04 \$153,216 00

FY05 \$177,002 00

FY06 \$152,632 00

Abstract

Proposal offers a strategy for developing a monitoring program for watersheds that would form the basis for a comprehensive understanding of water quality and biological production in relation to natural and human induced variability. Sampling strategy effectively leverages existing funding from Oil Spill Recovery Institute and North Pacific Research Board to minimize costs. Data derived on isotopic signatures of C, N, and S will be invaluable in designing monitoring throughout the GEM area. Important new information would be produced on effects of watersheds on productivities of nearshore environments, the feasibility of using sulfur as indicator of marine related effects, and the relation of MDN to freshwater residence time in juvenile salmon.

STAC Recommendation

Proposal offers a clear strategy for developing a monitoring program for watersheds that would form the basis for a comprehensive understanding of water quality and biological production in relation to natural and human induced variability. Sampling strategy effectively leverages existing funding from Oil Spill Recovery Institute and North Pacific Research Board to minimize costs. Data derived on isotopic signatures of C, N, and S will be invaluable in designing monitoring throughout the GEM area. Important new information would be produced on effects of watersheds on productivities of nearshore environments, the feasibility of using sulfur as indicator of marine related effects, and the relation of MDN to freshwater residence time in juvenile salmon. Proposal makes good case that the management implications of information for salmon and salmon-dependent economies and wildlife are very strong for ADF&G, NMFS, and USFWS. On the negative side the proposal has some serious shortcomings in the presentation of hypotheses and methods. Hypotheses need to be re-written to remove tautologies, maps of sampling localities need to be provided, and field methods for sampling and estimation of abundance need to be clearly explained. Fund contingent on receipt of revised proposal addressing peer reviewer concerns.

Executive Director's Recommendation

The project provides information on terrestrial-marine linkages in the nearshore and riverine environments that is essential to planning watershed monitoring. Revised proposal addressed peer reviewer concerns. The Principal Investigators agreed to participate in a watershed workshop will be held at the January 2005 GEM meeting, and to present an up-to-date report on progress and participate in comparison and evaluation of methods. Fund.

Project Konar-FY04-Natural Geography in Shore Areas

Project Title Alaska Natural Geography in Shore Areas Year 2 of a Census of Marine Life Initial Field Project

Location Kodiak Island, PWS and Kachemak Bay

Proposer Brenda Konar

Proposer Affiliation Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$248,729 00

FY05 \$0 00

FY06 \$0 00

Abstract

This proposal seeks funding to complete the initial nearshore biodiversity surveys that were started in the summer of 2003 in Kodiak Island, Prince William Sound and Kachemak Bay. These surveys are part of a pole-to-pole latitudinal gradient in macroalgal rocky bottom and seagrass soft bottom habitats that is applying standardized protocols developed under the Census of Marine Life program. In our second year of funding we will resurvey all sites that were sampled in 2003 for temporal resolution and will retrieve the temperature data loggers that were deployed at all sites in 2003 so that physical data can be incorporated for each study site. The project is heavily based on local community involvement for sampling. Expected outcomes are establishment of a biodiversity database for current regional and global comparisons and future long-term monitoring programs, capacity building, and a broad outreach to the public.

STAC Recommendation

This proposal seeks funds to complete the initial nearshore biodiversity surveys started in the summer of 2003 in Kodiak Island, Prince William Sound and Kachemak Bay. The surveys were funded using EVOS funds. The surveys are part of a pole-to-pole latitudinal gradient in macroalgal rocky bottom and seagrass soft bottom habitats that is applying standardized protocols developed under the Census of Marine Life Program. Funding in second year will allow resurvey of all sites sampled in 2003 and incorporate physical data for each study site. The sampling aspects of the surveys have strong local community involvement. The results of this project will establish a biodiversity database for current regional and global comparisons and future long-term monitoring programs, capacity building, and a broad outreach to the public. Fund at level requested originally.

Executive Director's Recommendation

The proposal continues a process started in FY 03 for exploring possibilities for nearshore monitoring sites that are conducive to community involvement in terms of the questions addressed and the data collected. Sites were explored and samples collected in FY 03 and analysis and recommendations are expected during FY 04. Fund

Project *Kopchak-FY04-Resource Mapping*

Project Title Cordova Community Resource Mapping

Location Prince William Sound and the Copper River Drainage

Proposer Robert Kopchak

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

This project would utilize an integrated GIS database and produce maps of resources that the people of Cordova and the surrounding area are dependent on. The effort would build upon existing projects either completed or under development by Alyeska Pipeline Service Co., US Forest Service, NMFS, Alaska Departments of Fish and Game, Environmental Conservation, and Dept. of Natural Resources, BLM, PWSRCAC, Ecotrust, and others. The effort would be an integral part of, and a complement to a three-year Copper River drainage resource assessment, currently being undertaken by Ecotrust. The GIS maps would be made available to institutional users and the general public through web site access (PWS Science Center, Ecotrust, and GEM/EVOS) for research and educational purposes.

STAC Recommendation

This is an interesting project that proposes to synthesize data for the Cordova Resources Area in an integrated GIS database; however, there are still some major questions that need to be addressed before the project could be recommended for funding. First, the "Cordova Resource Area" is not defined in the proposal. There is no map and at times it refers to the Copper River and other times refers to the Cordova area and then in FY06 to "integrate where possible PWS data into GIS system." Additionally, it is difficult to determine exactly what is proposed. The proposed objectives (II A) are vague. What exactly is going to be produced? How are "all sensitive areas" defined? Why are only critical salmon habitats to be profiled and not habitats for other species like herring? The methods (II B) are the same as the milestones. Furthermore (II C) "GEM QA/QC requirements" need to be specifically defined. The qualifications of the PI need to be established by providing a CV. The proposal was not coordinated with the other projects in the GEM region that are using some kind of mapping. Do not fund.

Executive Director's Recommendation

Methodological problems identified in the peer review process are not surmountable during the present funding cycle. Do not fund.

Project Kulkarni-FY04-Design for Data Management

Project Title A Design for a Data Management and Information Portal for GEM - Submitted under the BAA

Location Data & Information Management Proposal on Site

Proposer Ravi Kulkarni

Proposer Affiliation Non Alaskan University

Lead Agency NOAA

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

The GEM program relies on data collection from a wide variety of sources, including insitu, remote sensing, modeling and simulation, and derived datasets. In addition multiple disciplines of biology, oceanography, meteorology, and others are needed to provide a truly synoptic view of the data and their interpretation. This proposal seeks to design an infrastructure that can be used as an extensible framework for the tasks of data preparation and submission to a repository, peer review and “publication” of datasets, and collaborative data analysis and visualization for the purposes of internet based virtual data analysis workshops (CDAW). The idea of representing data preparation and peer review as “business processes” has been adopted from NASA/Planetary Data System.

STAC Recommendation

This proposal provides an analysis of a set of tools which can be used to provide data access, processing, and visualization to distributed oceanographic data sets. What this proposal seriously lacks is any type of implementation scheme or plan to provide a deliverable data product. The author, Kulkarni, was involved in a successful NASA project to provide data access to planetary orbiting data. In this proposal Kulkarni attempts to adapt the model for planetary data to data which is of the oceanographic type. Many of diagrams and figures included in this proposal reference orbiting or planetary information, these figures should be referencing oceanographic variables, looks as if most of this proposal contains recycled content. The proposal references various open source technologies to accomplish its goals such as Java, OpenDX, and OpenMap. These technologies make up the correct toolset for the creation of a data management solution for GEM but the proposal provides no implementation scheme. Many of the deliverables listed in the proposal are analogous to solutions already created by the OPeNDAP community using the same open source tools. In addition, this proposal's response to the FY04 invitation is very poor and does not adequately address any of the issues listed in the data management section. Do not fund.

Executive Director's Recommendation

The proposal was not responsive to the Invitation for Proposals, and as a consequence it addresses products not needed at this time. Do not fund.

Project Lilly-FY04-Fate and Transport Modeling

Project Title Intertidal Contaminant Fate and Transport Modeling

Location Prince William Sound

Proposer Michael Lilly

Proposer Affiliation Private Enterprise

Lead Agency NOAA

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

The fate and transport of oil and dissolved hydrocarbons in the beach environment is a critical process to characterize for development of monitoring programs under the GEM plan. The intertidal zone is the boundary zone between highly productive ecosystems and the flux of hydrocarbons in beach ground-water systems. The amount and duration of hydrocarbon loading across the intertidal zone is important for understanding how biological systems respond to hydrocarbons acting as long-term sources. We will synthesize existing data on beaches containing hydrocarbons, and identify the biogeochemical processes and nearshore ground-water dynamics of typical beaches still bearing impacts of the oil spill. Numerical modeling will be used to understand and demonstrate how these processes work. This effort will help GEM program planners evaluate what data-collection needs exist for long-term monitoring of hydrocarbons and what information is needed to better understand and model fate and transport processes in impacted beach environments.

STAC Recommendation

This proposal will produce a literature summary and conceptual model of the fate and transport of oil in intertidal habitats in Prince William Sound. There is no link between the proposed study plan and the ability to assess the impacts of lingering oil in intertidal habitats. The proposal did not specify any time-period for which contaminant transport would be modeled. There was no discussion or apparent understanding of the extent of oil loading or degree of weathering of oil residues as of 2003. It seems as though the proposers have little knowledge of the composition of crude oil as a complex mixture, the weathering processes that affect water-soluble components over 13 years, which compounds have ecological significance, etc. Their example figures had little application to the actual intertidal settings or oil distributions. They propose to create conceptual and contaminant transport models for “index” or “type-beaches” in PWS without any effort to validate the results. I would have at least expected to have some field data to validate the simplest of model outputs, such as ground-water salinity. Recommendation: Do not fund.

Executive Director’s Recommendation

The proposal is not responsive to the needs of the program at this time. Do not fund.

Project **Macklin-FY04-NGOA Metadatabase**

Project Title A Comprehensive, Web-accessible, Geo-referenced Metadatabase of Marine-related Physical and Biological Databases of the Northern Gulf of Alaska

Location Seattle, WA

Proposer S Allen Macklin

Proposer Affiliation NOAA

Lead Agency NOAA

Funding Recommendations

FY04 \$100,600 00

FY05 \$0 00

FY06 \$0 00

Abstract

This project will adapt for GEM purposes the North Pacific Ecosystem Metadatabase (NPEM, <http://www.pmel.noaa.gov/np/mdb/>) that has served information via the World-Wide Web since 1998. The adaptation will be a web-accessible metadatabase of marine science databases of the northern Gulf of Alaska. Appropriate records from the NPEM will be transferred to the GEM metadatabase, and additional records pertaining to GEM, PICES, NPRB, UAF/IMS, GLOBEC, FOCI, and similar research efforts will be added. Metadata will be coded to the FGDC standard using the 26 elements specified by MetaLite. As possible, metadata will include thematic, semantic and syntactic descriptors. This utility will include filtering capabilities to extract from existing metadata records those specific to the regions, habitat types, and subject areas defined by the working concepts of the GEM Science Plan. Compound searches of the metadatabase will allow selection of records by time, space, keyword, text string, etc., and results will be ranked according to their agreement with the search criteria. Work will be accomplished over a three-year period in Seattle, Washington.

STAC Recommendation

This proposal responds to data management needs identified in the invitation, however it goes beyond the needs identified and needs to be modified and reduced in order to be useful to the GEM program. Reduce the amount of effort outside the GEM program, apply additional effort to build expertise inside the GEM program. Scale down proposal to exclude Objective 2. Change proposal to focus on Objectives 1, 4 and 5, with emphasis on the GEM region and the nearshore areas in Objective 5. Remove the first part of Objective 3 which is to establish a web site as FGDC node, which is a NOAA responsibility. Clarify the need for remaining part of Objective 3 with respect to the FGDC NSDI and include in Objective 1 if possible. Fund the project for two years at amount not to exceed \$90K total over two years contingent on receipt of revised proposal addressing points above.

Executive Director's Recommendation

The proposal provides a workable solution to the metadatabase requirements of the GEM program, however its scope is well beyond that envisioned in the Invitation for Proposals. The proposal has been re-written and the budgets formulated to accommodate the recommendations of the STAC. Fund.

Project Mann-FY04-Reconstructing Sockeye Populations

Project Title Reconstructing Sockeye Populations in the Gulf of Alaska over the Last Several Thousand Years The Natural Background to Future Changes

Location Prince William Sound, Kodiak, Kenai Peninsula

Proposer Daniel Mann

Proposer Affiliation Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$91,500 00

FY05 \$42,500 00

FY06 \$40,000 00

Abstract

We are reconstructing changes in sockeye salmon abundance over the last 10,000 years using the 15N record left by salmon carcasses in the sediments of spawning lakes. Our research question is: What is the normal variability in sockeye salmon populations in the Gulf of Alaska and how does it relate to climatic changes in the Gulf of Alaska region? Our results provide a much-needed background to monitoring studies within the GEM program and to fisheries managers who are working to preserve and restore natural salmon runs. Results from 2002 and 2003 include two, new and unexpectedly complete records of salmon abundance in lakes on the Kenai Peninsula. Both records extend back to the time of regional deglaciation around 10,000 years ago. These new cores provide records of changing 15N that are five times longer than any previous record of salmon-run history. The unexpected length and richness of these new lake-core records have motivated us to request additional funds from EVOS to cover an additional year of full funding followed by a final year of analysis and synthesis.

STAC Recommendation

Mann and Finney propose to continue their studies of 15N in sediments in the spawning lakes. They are able to extend the record back 10,000 years. A goal is to establish what is normal salmon abundance and its variability. They propose to compare these sediments with other climate records in an attempt to explain causes of this variability. However, their assumption that the 15N post 1900 reflect the population size is incorrect. Since commercial fishing harvests began, it only reflects changes in salmon escapement. There is concern that because of limited other types of data, the investigators might develop simplified ideas regarding population changes. Since the sediments will remain viable for future analysis it was felt that this work did not require immediate funding.

Executive Director's Recommendation

Although this proposal is in an area of work that was not invited, it would provide comparative historical data on salmon abundance or salmon escapement levels of use in planning GEM watershed and nearshore studies. Based on the strength of the peer reviews, and the recommendation of the Public Advisory Committee, this study should be done if funds can be found. Issues remain with respect to the budget. Defer.

Project *Matkin-FY04-Killer Whales in PWS/Kenai Fjords*

Project Title Monitoring of Killer Whales in Prince William Sound/Kenai Fjords in 2004 -
Submitted under the BAA

Location PWS, Kenai Fjords Alaska

Proposer Craig Matkin

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$19,502 00

FY05 \$0 00

FY06 \$0 00

Abstract

This project transitions monitoring of the damaged resident AB pod and other resident pods and the petitioned as depleted AT1 transient population into a cooperative program with additional collaborative support from the Alaska Sea Life Center, NMFS and various foundations. Monitoring has occurred on a yearly basis since 1984 and was crucial in evaluating the continuing effects from the oil spill. In addition, the role of killer whales in the nearshore ecosystem and possible effects on sea otters will be examined. Community based initiatives such as Youth Area Watch and tour operator educational programs will be integrated. The proposed work will augment current research directed at transient killer whales(ASLC) and provide for annual monitoring of AB pod and other resident pods and includes analysis and reporting of results. In future years the project will be integrated with oceanographic monitoring.

STAC Recommendation

This proposal is by a hard-working, dedicated researcher who has followed these whales in Prince William Sound over many years. It is clear that killer whales in general are enjoying good growth of their populations. Some of the pods, such as AB and AT 1 have experienced problems and in the case of the AT 1 pod may be headed for extinction. The paradigms of killer whale social structure and what we wish to see happen are open to challenge, as for example "members" of AB pod are usually seen with another pod when they are sighted. It is clear that if AB pod was injured by the spill that it is on its way to recovery. There is little or no evidence that the problems of AT 1 pod, if they are as the investigator asserts related to the oil spill, as beaching of individual animals in 2000 and 2001 are eleven and twelve years after the spill. If the Trustee Council wishes to follow killer whale pod AB to recovery of pre-spill numbers, which is projected to occur in 2015, then monitoring need only be occasional. Recommendation: Do not fund.

Executive Director's Recommendation

Although the proposal does not provide a compelling case that the information gathered is essential for determining the status of an injured species, and the STAC raises serious concerns regarding the link to the presumed effects on killer whales to oiling, this is a very cost effective and highly leveraged proposal to extend a long time series of interest to many in the GEM region. As a highly leveraged project with multiple partners it has potential as a monitoring project in the GEM program, however fiscal constraints preclude a fund recommendation on this project. Defer

Project ***Mazumder-FY04-Marine-Derived Nutrients***

Project Title Marine-Derived Nutrients in the Kenai and Adjacent Watersheds Methods for Detecting Change

Location Cook Inlet drainage basin, Kenai Peninsula, Kenai River watershed

Proposer Asit Mazumder

Proposer Affiliation Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$146,292 00

FY05 \$147,414 00

FY06 \$132,942 00

Abstract

Kenai River Watershed (KenaiRW) is recognized for its abundant fish, wildlife and diversity of landscapes. Extensive consultation among stakeholders, communities and agencies has led to this proposal on the role of marine-derived nutrients (MDN) in sustaining the productivity of Kenai RW. We propose to develop robust methods and monitoring protocols to detect, understand and predict changes in MDN and its linkage to productivity and resources. We will test the robustness of several indicators (nutrients, stable isotopes, fatty acids, contaminants, foodwebs) of MDN in different ecosystem components of KenaiRW and seven other watersheds around Cook Inlet. In the 3rd year, we will begin testing the validity of these indicators to quantify the fate/transport of MDN linking various components of the watershed and their implications for the productivity of KenaiRW. We will also develop a platform for networking and communication among various research groups looking at watershed level changes in MDN and resource productivity.

STAC Recommendation

The proposal is well beyond the scope of the Invitation with regard to annual cost and the types of activities that are appropriate to GEM watersheds at this time. The proposal addresses the fundamental measurement questions posed in the Science Plan and the Invitation in objectives 1 – 3 and 8. Objectives 1 – 3 require thoroughly sampling one relatively large and complex watershed, when basic questions of how to measure marine influences in watersheds may best be answered at lower cost by sampling smaller, less complex watersheds that provide more geographic contrast. Objective 8 effects coordination among cooperating parties. Objectives 4 – 7 presume to make choices regarding modeling and selection of MDN measures and indicator species that are not envisioned in GEM planning until late FY 06 to early FY 07 when the results of the current phase of GEM watershed work becomes available. The GEM modeling program that will link the habitat types and guide investment in research is not prepared to handle the output from this ambitious sampling program. It is also not clear present knowledge of the variability in proposed measures of MDN and proxies is sufficient to design sampling of the scale of the proposal. Addition of matching funds would take the three year cost of this project to US\$ 1.2M which is well beyond the level of funding justified by the current state of knowledge of marine-terrestrial linkages in GEM watersheds. Recommend that proposal be revised to eliminate sampling sites outside the Kenai River watershed, and reduced within the watershed to a representative of each habitat type, and to focus on achieving objectives 1, 2, 3, and 8 over a three year period. Fund reduced.

Executive Director's Recommendation

The proposal provides needed measures of marine linkages in a watershed that is at high risk of degradation due to human activities, however its scope is far broader than envisioned in the Invitation for Proposals. The PI's provided a revised proposal incorporating the recommendations of the STAC and a letter agreeing to participate in a watershed workshop will be held at the January 2005 GEM meeting, and to present an up-to-date report on progress and participate in comparison and evaluation of methods. Revised proposal relies on \$100K in matching funds that have not been secured. The budget submitted in the revised proposal commingled matching and EVOSTC funds so that it was unclear what objectives could be accomplished in the absence of the matching funds, which have not been committed. Defer dependent on confirmation from matching fund sources and clarification of division of funding of objectives among funding sources.

Project McNutt-FY04-GEM Infrastructure - Lyn McNutt

Project Title Building the Infrastructure for the Gulf Ecosystem Monitoring (GEM) Program

Location GEM Monitoring Region

Proposer Lyn McNutt

Proposer Affiliation Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$80,835 00

FY05 \$80,713 00

FY06 \$83,271 00

Abstract

This proposal addresses modeling within the GEM Program, and the infrastructure necessary to implement and maintain a monitoring and data dissemination system for the northern Gulf of Alaska (GOA). Agreement on an interdisciplinary strategy is critical to effective resource management and problem solving in the northern GOA. Use of the GEM infrastructure in support of models and observations will identify and refine measures to describe, manage and predict the status and health of the ecosystem, provide data as information to managers and coastal communities, and communicate publicly the current state of the ecosystem.

Our goal is to provide consensus recommendations to EVOS on

- 1 Creation of an integrated ecosystem model for the northern GOA,
- 2 Understanding spatial and temporal scales for implementing a biophysical monitoring program, and,
- 3 Implementing the GEM infrastructure, including identification of strategies for cooperation, coordination, integration, and cost efficiency

STAC Recommendation

This is part of two separate proposals (McNutt's and Schumacher's) because budgets are from two separate institutions. The proposals must be considered together. This is an effective proposal to establish a framework and infrastructure for a modeling base for GEM. This proposal directly addresses the Invitation part C Modeling, and in particular it is in direct response to example #1 (p. 6) "Building the Infrastructure Necessary to Create, Develop and Maintain the GEM Model." The proposal will do three things essential to the success of GEM: (1) create an integrated ecosystem model for the NGOA, (2) understand spatial and temporal scales for implementing a biophysical monitoring program, and (3) implement the GEM infrastructure, including identification of strategies for cooperation, coordination, integration and cost efficiency. This would provide GEM with an overall structure for modeling. STAC recommends that an objective be added for resource users to actively participate in the workshop along with the scientists. In addition, STAC questions role of the student in the proposed work and asks that it be clarified. Finally, STAC recommends that activities be focused from the start on the crux of the modeling problem, which is how to provide information of use to managers from the GEM monitoring program. Fund both proposals contingent on receipt of revised proposals addressing STAC recommendations and question.

Executive Director's Recommendation

This proposal is an essential part of building the GEM Model. The GEM Model is the primary means of organizing the GEM information so that it can be used in understanding the status of

injured species, allowing natural resource dependent communities to anticipate change and helping managers anticipate changes in populations of birds, fish and mammals. Proposal provides comprehensive solutions to the need to bring together a team of professionals who can guide the development of the GEM Model. Revised proposal was submitted that incorporated the recommendations of the STAC Fund.

Project Merritt-FY04-GEM Watershed Synthesis

Project Title GEM Watershed Synthesis for Evaluation, Planning and Prioritization of Options

Location Watersheds of the GEM Area Majority of synthesis will occur in Fairbanks

Proposer Margaret Merritt ***Proposer Affiliation*** Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$58,091 00

FY05 \$39,751 00

FY06 \$0 00

Abstract

There is a need to synthesize relevant information into a published reference to guide policy makers and resource managers in implementing the watershed component of the GEM Program through identification of goals, objectives and issues, as well as the evaluation and prioritization of options. This project will evaluate aspects of the GEM Program's conceptual foundation, hypotheses and ideas relative to the state of current knowledge of watershed-marine linkages in the GEM area. In addition to scientific information, relationships between resource management and socioeconomic and political issues will be identified. A systems approach using accompanying software will be used to assist in structuring the problem. The resulting synthesis of information will be framed into a clear and easily communicable tool that can serve as a teaching aid.

STAC Recommendation

This proposal for watershed synthesis focuses on the pathway to the decision making framework, without clearly describing how the literature synthesis would be built from the foundation of GEM's primary source documents, as specified in the Invitation. On the positive side, the proposal provides a reasonable approach for identifying and selecting options for projects that might be implemented in the GEM watershed habitat type in FY 06, and a further positive is that it would do so by incorporating information and opinions of people from multiple watershed-related communities, including managers and scientists. On the negative side it does not clearly articulate as a top priority the primary need to fully develop the introduction of the watershed habitat type in the GEM Science Plan. The Invitation calls for "a synthesis of scientific literature and existing data gathering programs." In addition, the proposed schedule is partly out of synchrony with the annual funding cycle. For example, in order to contribute to the development of the FY 06 Invitation, an additional milestone of a draft literature synthesis accompanied by ProCite bibliography by Sept 30, 2004 would have been necessary. Do not fund

Executive Director's Recommendation

Agreement with the author to identify the literature survey and supporting staff necessary to the synthesis, and to address reporting requirements should be attainable within the present funding cycle. Defer

Project *Nelson-FY04-Hydrocarbon Database*

Project Title The Exxon Valdez Trustee Hydrocarbon Database and Interpretation Service

Location entire spill area

Proposer Bonita Nelson

Proposer Affiliation NOAA

Lead Agency NOAA

Funding Recommendations

FY04 \$22,200 00

FY05 \$22,200 00

FY06 \$22,200 00

Abstract

This project is an on-going service project providing data and sample archiving services for all samples collected for hydrocarbon analysis in support of Exxon Valdez Oil Spill Trustee Council projects. These data represent samples collected since the oil spill in 1989 to the present and include environmental and laboratory Response (National Resource Damage Assessment - NRDA) and Restoration data. Additionally, we provide interpretive services for the hydrocarbon analysis, provide public releases of the database (including FOIA requests) and maintain the hydrocarbon sample archives.

STAC Recommendation

This proposal would extend the management of the data base that is used to track samples for hydrocarbon analyses and continue to make available interpretive services related to origin of oil and its composition, including the likelihood of toxicity. This project is modest in cost and is needed if the Trustee Council is to continue to investigate possible links between oil remaining in the environment and species that apparently have not recovered from the spill. Recommendation Fund.

Executive Director's Recommendation

Proposal provides an essential service required while the possibility of litigation exists. Fund.

Project Okkonen-FY04-Monitoring Program in the NE Pacific Ocean

Project Title A Monitoring Program for Near-Surface Temp, Salinity, and Fluorescence Fields in the northeast Pacific Ocean Transition to an Operational Program

Location N Gulf of Alaska

Proposer Stephen Okkonen

Proposer Affiliation Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$27,289 00

FY05 \$30,366 00

FY06 \$31,455 00

Abstract

This proposed project responds to the Gulf Ecosystem Monitoring and Research Program invitation category F 2 (Alaska Coastal Current / Collecting physical and biological observations from non-AMHS ships-of-opportunity) Funds are requested to continue (1) the maintenance and operation of a thermosalinograph (TSG) that was installed on the tanker vessel Polar Alaska in July 2002 and (2) the analyses of the collected data The TSG was originally funded as a pilot project by the EVOS Trustee Council in FY02

STAC Recommendation

Dr Okkonen and subcontractor Dave Cutchin of Scripps maintain and collect data from a thermosalinograph operating continuously during sea runs on the tanker T/V Polar Alaska transiting from Valdez to alternately San Francisco and Long Beach Cutchin meets the ships at the south end, consults with the chief and second engineers about concerns regarding the system, copies the data from the hard drive of the dedicated computer and services the system (6 times per year) Okkonen reviews, quality checks and archives the data, updating it on a public web site each operation cycle Okkonen is also using the data to identify the locations on each passage of specific current features (ACC is discerned as drops in S and T, the shelf-break jet or Alaska stream similarly, and oceanic eddies as extended drops in just salinity) He is comparing these features to sea surface topography from TOPEX-POSEIDON altimetry Data are transferred to the Batten-Welch CPR project that also operates from the Polar Alaska An initial fluorometer installation failed, but fluorometry should be available by mid-summer 2003 Sustaining fluorometry is anticipated Fund

Executive Director's Recommendation

Past performance of the investigators and the results to date, have established this project as a low cost means of collecting basic physical data in the nearshore and offshore areas that should be of use to the GEM Model when it is operational Fund

Project Pegau-FY04-Studying the ACC

Project Title Studying the ACC within Cook Inlet using Volunteer Observing Ships

Location Lower Cook Inlet and Kachemak Bay

Proposer Scott Pegau

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

This project is designed to monitor changes in the coastal oceans using instruments on vessels of opportunity. The scientific goal is to observe the variations in the flow of the Alaska Coastal Current (ACC) in order to better understand the natural and anthropogenic influences on lower Cook Inlet. In particular, we are interested in understanding how the flow of the ACC interacts with Kachemak Bay. If the ACC enters Kachemak Bay it can carry larvae that can replenish fish and intertidal organisms. The project will produce a basic instrument suite appropriate for installing on all sizes of vessels that regularly operate in the coastal waters of the Gulf of Alaska. The measurements will include temperature, salinity, chlorophyll and CDOM fluorescence, and turbidity. The work will be done in Homer, Alaska at the Kachemak Bay Research Reserve, but techniques will be transferable to other regions in the Gulf and Prince William Sound.

STAC Recommendation

Although the goal of quantifying ACC penetration into lower Cook Inlet and, particularly, into Kachemak Bay is important to understanding lower Cook Inlet, the applications of the proposed data and the intervals over which it will be of value to monitor them have not been fully thought out. They need to resolve the sampling problem and the tidal model necessary to de-tide the data. The ferry monitoring would cover a significant part of this area. Do not fund.

Executive Director's Recommendation

The proposal correctly identifies sampling opportunities that could be important in understanding changes in populations of birds, fish and mammals in the northern Gulf of Alaska, however substantial issues were identified in the peer review process. Technical issues are not resolvable within the current funding cycle. Do not fund.

Project *Renner-FY04-Population Modeling*

Project Title Population Modeling of Kittlitz's Murrelet (*Brachyramphus brevirostris*)

Location PWS, Kachemak Bay, Adak

Proposer Martin Renner

Proposer Affiliation Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

Kittlitz's Murrelet were seriously impacted by the Exxon Valdez Oil Spill and have not recovered but continued to decline alarmingly (listing under Endangered Species Act has been petitioned) We propose to catch and radio tag Kittlitz's Murrelet to find nests, monitor habitat use and estimate survival by mark-recapture Field work will be conducted at three sites (Prince William Sound, Kachemak Bay, Adak) over three years Sites are selected to reflect a gradient from heavily glaciated to near glacier, to no glacier All data will be gathered to build a comprehensive population model used for a Population Viability Analysis All data will be made openly available on the web

STAC Recommendation

A large number of marbled murrelets, the predominant murrelet in PWS, were killed by the spill, and it is not known for sure how many Kittlitz's murrelets may have been included in the "unidentified murrelet" category among the carcasses recovered after the spill This species is found predominantly in glacial fjords and none of these environments were oiled significantly None-the-less, this species is in danger of extirpation and PWS is a major population center for this species A large number of marbled murrelets, the predominant murrelet in PWS, were killed by the spill, and it is not known for sure how many Kittlitz's Murrelets may have been included in the "unidentified murrelet" category among the carcasses recovered after the spill This species is found predominantly in glacial fjords and none of these environments were oiled significantly None-the-less, this species is in danger of extirpation and PWS is a major population center for this species The methods of achieving the project goals are appropriate and the personnel are experienced in this sort of work However, the budget is too modest to support the kind of effort needed to locate and verify nests and marked individuals The connection between lingering oil and populations of this species in the spill area are weakly made, as in fact they are weak From the standpoint of concern for ongoing spill effects, this project is weakly justified, but it may have value for what the population indicates for the shrinking habitat of the tidewater glacial fjord, if this a concern in the GEM program Do not fund

Executive Director's Recommendation

The project is not well justified in terms of the Restoration objective of understanding the status of an injured species in relation to the past and present effects of oiling Developing the background for federal listing under the Endangered Species Act is not an appropriate task for this funding source Do not fund

Project **Rice-FY04-Lingering Population Status**

Project Title Lingering Oil Pathways of Exposure and Population Status (ABL)

Location Prince William Sound

Proposer Stanley Rice

Proposer Affiliation NOAA

Lead Agency NOAA

Funding Recommendations

FY04 \$60,000 00

FY05 \$61,000 00

FY06 \$29,100 00

Abstract

Lingering oil from the Exxon Valdez oil spill remains throughout Western Prince William Sound and appears to have chronic effects on sea otter and sea duck populations in these areas. Studies conducted in 2001-02 have documented the extent of oiling throughout the sound, and as of this writing, we have determined that oil is bioavailable to predators. Bioavailability defines potential for exposure, but is not equal to exposure or significance. In 2003 and 2004, we are determining the significance of lingering oil by quantifying the probability of oil encounters in areas where sea otters and sea ducks have not recovered. Prey and passive samplers collected in 2003 will be analyzed in 2004, and will be supplemented with additional samples in 2004 to meet the needs of the on-going tagging studies of otters and ducks by USGS. With the mechanism of exposure from lower intertidal oil deposits determined, the research theme will move toward the goal of determining the extent and probability of oil exposure in three restricted areas: Herring Bay, Lower Passage, and Bay of Isles. Information gained in this project could aid in the decision process regarding future mitigation, litigation, or clean-up actions.

STAC Recommendation

Lingering oil from the Exxon Valdez oil spill remains throughout Western Prince William Sound and may be having chronic effects on sea otter and sea duck populations in these areas. Studies conducted in 2001-02 have documented the extent of oiling throughout the sound, and the subsurface oil is bioavailable to predators. Bioavailability defines potential for exposure, but the extent to which oil exposure is occurring and whether such exposure may be deleterious is uncertain. In 2003 and 2004, this project will determine the significance of lingering oil by quantifying the probability of oil encounters in areas where sea otters and sea ducks have not recovered. Prey and passive samplers collected in 2003 will be analyzed in 2004, and will be supplemented with additional samples in 2004 to meet the needs of the on-going tagging studies of otters and ducks by USGS. With the mechanism of exposure from lower intertidal oil deposits determined, the research theme will move toward the goal of determining the extent and probability of oil exposure in three restricted areas: Herring Bay, Lower Passage, and Bay of Isles. Information gained in this project could aid in the decision process regarding future mitigation, litigation, or clean-up actions. This project is well designed and complementary to the sea otter/sea duck project by Bodkin et al. It is a key component of the strategy the Trustee Council undertook in FY2002 to determine if remaining oil is a significant factor in lack of recovery of some species such as sea otter and sea ducks. The technical merits are high. The proposal is responsive to the invitation with relevance to management and community involvement. The management application is moderate. The qualifications of the PIs are excellent as is their past performance on other EVOS funded projects. Defer funding decision pending outcome of November workshop and disposition of the matter of reports for projects 00396 and 00454.

Executive Director's Recommendation

The specific requirements for further work on lingering oil need to be further developed during a workshop to be conducted in November 2003. As identified by the STAC, it is important for the preliminary results of the FY 2003 field season to be considered by legal counsel, EVOS staff, advising scientists and the Trustee Council before decisions on funding are made. The exchange between legal, policy and science people will be reported to the Trustee Council before making decisions on what to do in the summer of 2004, which is the last full field season of data that could be fully analyzed before deciding the path to the re-opener. Defer funding decisions pending the outcome of the November workshop.

Project Rosenberg-FY04-Harlequin Duck Population

Project Title Harlequin Duck Population Dynamics in Prince William Sound Measuring Recovery

Location Prince William Sound

Proposer Dan Rosenberg

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$37,100 00

FY05 \$0 00

FY06 \$0 00

Abstract

This project will address the effects of lingering oil in nearshore habitats of Prince William Sound on populations of harlequin ducks. We will conduct winter boat surveys to test if harlequin ducks have recovered from the effects of the EVOS by comparing population structure and trends between oiled and unoiled treatments in four areas (2 oiled, 2 unoiled) of PWS. Similar structure and trends between oiled and unoiled areas will indicate populations have recovered or are in a position to recover. Work will be complimentary to studies addressing cytochrome P450 induction and over winter survival of female harlequin ducks to give a complete picture of the effects of lingering oil. We will also test for geographic differences in population structure and trend for oiled and unoiled treatments. This is a continuation of surveys begun in 1997. Up to 3 years of surveys are proposed with the results of each year determining the need for continuation.

STAC Recommendation

The proposal was well reviewed and is relevant to the Trustee Council's strategy for investigating the links between oil and the recovery of affected populations. Fund contingent on resolution of outstanding reports 00273 and 02407.

Executive Director's Recommendation

This is a reasonably priced survey to estimate the abundance of a species, the harlequin duck, which is known to have continuing exposure to Exxon Valdez in the oil spill affected areas of Prince William Sound. Unfortunately there are overdue reports associated with project personnel, so the proposal cannot move forward until conclusion of matter of outstanding reports on scoters. Fund Contingent.

Project *Ruesink-FY04-Altering the Community Structure*

Project Title Investigating the Relative Roles of Natural Factors & Shoreline Harvest in Altering the Community Structure, Dynamics & Diversity of the Kenai Peninsula

Location Kenai Peninsula

Proposer Jennifer Ruesink

Proposer Affiliation Non Alaskan University

Lead Agency NOAA

Funding Recommendations

FY04 \$81,600 00

FY05 \$0 00

FY06 \$0 00

Abstract

The surf swept rocky shores of the outer Kenai Peninsula are the home of three Sugpiaq native villages where the black chiton, *Katharina tunicata*, remains an important traditional subsistence food source. This benthic invertebrate is also a competitively dominant herbivore known to have dramatic impacts on the structure, dynamics and diversity of the rocky intertidal. In collaboration with tribal members, we will evaluate the relative roles of natural factors (predation/grazing & natural variability) and anthropogenic impacts (*Katharina* harvest) in altering intertidal community structure. The project addresses the core GEM hypothesis of human versus natural impacts on the structure and productivity of coastal ecosystems. It will also provide an additional field season (2004) of valuable baseline monitoring in the intertidal zone that could be continued in the future as part of a long-term time series. Local tribes will be involved in both developing and carrying out research which will match the GEM commitment to community based science.

STAC Recommendation

This proposal has strong community involvement. It is probably as well designed as it can be in this context, although it is not absolutely certain it can resolve the fundamental questions asked. It does have long term monitoring potential and is probably good value in terms of baseline information, even if the scientific question remains unresolved. Fund at level originally requested in FY 2003.

Executive Director's Recommendation

The proposal has a strong community involvement component, having been originated by the village of Port Graham as an investigation targeting an important subsistence resource (the black chiton also known as the Bidarkı or black gumboot) that is not studied by other agencies. It is also likely to make a substantial contribution to the development of the nearshore monitoring program. Fund.

Project Saupe-FY04-Habitat Web Site

Project Title Alaska Coastal Habitat Web Site

Location Kenai Peninsula including Kachemak Bay and outer coast

Proposer Susan Saupe

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$21,100 00

FY05 \$0 00

FY06 \$0 00

Abstract

This proposal is to develop an Alaska Coastal Habitat Web Site based on several products currently being produced using ShoreZone Mapping techniques. This proposal will tie together several components in a user-friendly, web-accessible format. In a recent workshop hosted by EVOS and attended by personnel from local, state, and federal agencies, universities, and not-for-profit organizations, participants strongly endorsed a coordinated process for continuing coastal mapping and the wide-spread distribution of data through web accessibility. The group also emphasized that the data should be provided in a user-friendly way that will facilitate use by the general public.

This proposal outlines a plan to (a) make recently collected ShoreZone data immediately web-accessible, (b) combine ShoreZone mapping data with the existing Gulf of Alaska Coastal Imagery web site, and (c) combine ShoreZone mapping data with detailed site-specific data for various habitats and descriptions of biological assemblages and species.

The project will be coordinated by the Cook Inlet RCAC through a subcontract to Coastal and Ocean Resources, Inc. (CORI) who developed the ShoreZone techniques and who is currently conducting various ShoreZone mapping projects in the GEM area. CORI is located in Sidney, British Columbia, where much of the work will be conducted. The Public Outreach development portion will be conducted in Kenai at the Cook Inlet RCAC offices and community visits will take place at various places on the Kenai Peninsula as well as to resources agencies in Anchorage.

STAC Recommendation

This proposal provides a mechanism for the dissemination of biological coastal information through the web which is cost efficient and practical. Drawing upon methodologies previously implemented in past years, Saupe and Harper plan to expand their coastal web site technology to include more Alaskan coastline in addition to more specific site data (e.g., "data for various habitats and descriptions of biological assemblages and species"). Saupe and Harper will use an ArcIMS mapping engine to facilitate their electronic mapping which is a robust solution but has its drawback due to it being proprietary to ESRI. The project will need to be vigilant in identifying clients using MAPInfo who have a difficult time downloading data from the website and using it on their systems. Overall, this proposal delivers a high degree of data visualization for the small amount requested. Fund.

Executive Director's Recommendation

The project provides and adds value to coastal habitat mapping information collected by GEM and other agencies by making the information more readily available. The information is expected to have a high potential for use in planning research and to local governments in understanding and managing coastal development. Fund.

Project Schneider-FY04-Kodiak Archipelago

Project Title Kodiak Archipelago Youth Area Watch

Location Kodiak Archipelago

Proposer Teri Schneider

Proposer Affiliation Local Government

Lead Agency ADFG

Funding Recommendations

FY04 \$63,000 00

FY05 \$63,000 00

FY06 \$63,000 00

Abstract

The Kodiak Archipelago Youth Area Watch is an ongoing community involvement project designed to engage students in projects with goals aligned with the general restoration efforts of the Trustee Council. Students and site coordinators will conduct interviews with local experts and document TEK, publishing it in a District oral history magazine. Participation of KAYAW adults and students in the annual Academy of Elders/Science Camp will be strongly encouraged. Participants will share their research during annual gatherings. Such participation will serve as another avenue for more tribal members to learn about restoration efforts, scientific monitoring techniques, and occupations related to such work. Students will explore local knowledge as it relates to marine mammal populations, inter-tidal environment, impact of humans on the coastal environment, human use overtime and intergenerational changes and cultural beliefs and practices that may provide insight in scientific studies. The value and implications of TEK will be strongly emphasized throughout the implementation of the KAYAW project.

STAC Recommendation

This is a very competent proposal that creates its own activities based on addressing local interests and concerns as they relate to GEM. The types of activities described in the proposal (resource inventory, habitat mapping, ecology, human effects on resources (page 1) are consistent with information needed to be able to design a local monitoring program. The KAYAW has expanded slowly and the proposed work areas (continuing harbor seal data gathering, continuing focus archaeological and natural resources, and working with the nearshore monitoring project conducted by UAF [Dr. Robert Foy]) are a form of monitoring. Furthermore, the project design has monitoring objectives and study procedures. The proposal is responsive to the invitation (continuing community involvement project), is consistent with one of two GEM strategies (incorporate community involvement), and is proactive in moving toward a GEM-style monitoring youth area watch program. Fund.

Executive Director's Recommendation

The report on approaches to community involvement commissioned by the Trustee Council in FY 2003 will not be available until the end of September 2003. The report is expected to provide the basis for a thorough examination of the role of community involvement in the GEM program to be conducted by the Executive Director during FY 2004. Until that examination is complete, funding of community involvement projects will be based on responsiveness to the criteria in the FY 04 Invitation and past and future utility for implementing the GEM program. The Kodiak Youth Area Watch proposal is well grounded in the principles of the GEM program and shows a keen understanding of the concepts of the roles and needs for community involvement in long-term monitoring programs. The connection to the GEM Science Plan is clear, and the recommendations of the STAC are very positive. Fund.

Project Schoch-FY04-Oceanographic & Ecological Process

Project Title Linkage Oceanographic and Ecological Process in Nearshore Environments

Location Lower Cook Inlet and Kachemak Bay

Proposer Carl Schoch

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

Our goal is to investigate the processes that generate conspicuous patterns of diversity and species composition in the nearshore of Kachemak Bay and how ecological communities respond to variation or modification of these processes. We hypothesize that there are two principal physical forces driving community structure and spatial distribution of kelp forests in Kachemak Bay: 1) the behavior of tidal and density driven coastal currents including the ACC, and 2) the nearshore wave and sediment dynamics. We will: 1) Evaluate the effects of seasonal to interannual variability of the ACC in Kachemak Bay, 2) Quantify habitat change as a function of wave energy and sediment transport and how these are modified by anthropogenic processes such as coastal development and human use, and 3) investigate the role of coastal currents and habitat change on kelp forests, and the spatial and temporal variability of selected populations of fishes, invertebrates, and plants.

STAC Recommendation

This is a promising proposal, but nearshore monitoring proposals were not invited. The opportunity to invite nearshore proposals awaits the analysis of the Bodkin and Dean report, and results of other nearshore projects funded in FY 03. This proposal focuses on the influence of hydrodynamics on kelp communities. An interesting set of questions, but, if that were all it did, it would be very expensive. Tidal corrections need to be considered when proposal is resubmitted in the future. However, it has good matching funds and talent commitment from federal sources and it establishes an interface between long-term physical and biological monitoring that has great promise. Do not fund.

Executive Director's Recommendation

Although the proposal addresses needs established in the GEM Science Plan for the nearshore, it is premature with respect to the GEM process, which does not envision establishing projects like this one until the information on nearshore monitoring gathered in FY 2002 – FY 2004 can be assimilated into a nearshore synthesis. Do not fund.

Project *Schumacher-FY04-GEM Infrastructure*

Project Title Building the Infrastructure for the Gulf Ecosystem Monitoring (GEM) Program - Submitted Under the BAA

Location GEM Monitoring Region-northern Gulf of Alaska

Proposer James Schumacher **Proposer Affiliation** Private Enterprise

Lead Agency NOAA

Funding Recommendations

FY04 \$22,067 00 **FY05** \$23,645 00 **FY06** \$22,067 00

Abstract

This proposal addresses modeling within the GEM Program, and the infrastructure necessary to implement and maintain a monitoring and data dissemination system for the northern Gulf of Alaska (NGOA). Agreement on an interdisciplinary strategy is critical to effective resource management and problem solving in the NGOA. Use of the GEM infrastructure in support of models and observations will identify and refine measures to describe, manage and predict the status and health of the ecosystem, provide data as information to managers and coastal communities, and communicate publicly the current state of the ecosystem.

Our goal is to provide consensus recommendations to EVOS on

- 1 Creation of an integrated ecosystem model for the NGOA,
- 2 Understanding spatial and temporal scales for implementing an ecosystem monitoring program, and,
- 3 Implementing the GEM infrastructure, including identification of strategies for cooperation, coordination, integration, and cost efficiency

STAC Recommendation

This is part of two separate proposals (McNutt's and Schumacher's) because budgets are from two separate institutions. The proposals must be considered together. This is an effective proposal to establish a framework and infrastructure for a modeling base for GEM. This proposal directly addresses the Invitation Part C Modeling, and in particular it is in direct response to example #1 (p. 6) "Building the Infrastructure Necessary to Create, Develop and Maintain the GEM Model." The proposal will do three things essential to the success of GEM: (1) create an integrated ecosystem model for the NGOA, (2) understand spatial and temporal scales for implementing a biophysical monitoring program, and (3) implement the GEM infrastructure, including identification of strategies for cooperation, coordination, integration and cost efficiency. This would provide GEM with an overall structure for modeling. STAC recommends that an objective be added for resource users to actively participate in the workshop along with the scientists. In addition, STAC questions the role of the student in the proposed work and asks that it be clarified. Finally, STAC recommends that activities be focused from the start on the crux of the modeling problem, which is how to provide information of use to managers from the GEM monitoring program. Fund contingent on receipt of revised proposals addressing STAC recommendations and question.

Executive Director's Recommendation

This proposal is an essential part of building the GEM Model. The GEM Model is the primary means of organizing GEM information so that it can be used in understanding the status of

injured species, allowing natural resource dependent communities to anticipate change, and helping managers anticipate changes in populations of birds, fish and mammals. Proposal provides a comprehensive solution to the need to bring together a team of professionals who can guide the development of the GEM Model. Revised proposal was submitted that incorporated the recommendations of the STAC Fund.

Project Short-FY04-Monitoring Exxon Valdez Oil & PWS

Project Title Development of a Strategy for Monitoring Exxon Valdez Oil and other Contamination in PWS

Location Prince William Sound

Proposer Jeff Short

Proposer Affiliation NOAA

Lead Agency NOAA

Funding Recommendations

FY04 \$45,900 00

FY05 \$0 00

FY06 \$0 00

Abstract

This project will evaluate alternative sampling designs and strategies for monitoring oil from the T/V Exxon Valdez remaining on beaches in Prince William Sound, along with other hydrocarbon contaminants from anthropogenic and natural sources, and will make recommendations regarding overall sampling design, duration and frequency. The recommended strategy will be optimized for statistical power based on existing knowledge of the distributions of hydrocarbons from known sources, and will include a means of increasing power as more knowledge is gained through sampling as monitoring proceeds. The recommended strategy will incorporate results from the Prince William Sound Regional Citizens' Advisory Committee's Long Term Environmental Monitoring Program, and will explicitly recommend how the results from this program may be efficiently augmented.

STAC Recommendation

This project will evaluate alternative sampling designs and strategies for monitoring oil from the T/V Exxon Valdez remaining on beaches in Prince William Sound, along with other hydrocarbon contaminants from anthropogenic and natural sources, and will make recommendations regarding overall sampling design, duration and frequency. The recommended strategy will be optimized for statistical power based on existing knowledge of the distributions of hydrocarbons from known sources, and will include a means of increasing power as more knowledge is gained through sampling as monitoring proceeds. A distinct advantage of this project is that two top scientists, Roger Green and Jeff Short, will provide a very solid basis for future monitoring for hydrocarbons of all sources. Optimizing sampling for maximum power to detect change is particularly beneficial for programs that the TC has chosen to support, e.g., the Regional Citizen's Advisory Committee mussel watch type program in PWS. The technical merits are good. The proposal is responsive to the invitation with relevance to management and community involvement. The qualifications of the PIs are outstanding. Fund contingent upon receipt of outstanding reports 00195, 01195, 02195, 00290, 01290, 00598, 01599, and 02543.

Executive Director's Recommendation

Proposal would provide very useful information on how to incorporate the study of lingering oil effects into the GEM monitoring program, however the PI has eight overdue reports. Funding is contingent on receipt of acceptable drafts of overdue reports. Fund contingent.

Project *Spies-FY04-EVOS Damage Assessment & Restoration*

Project Title A synthesis of the ecological findings from the EVOS Damage Assessment and Restoration Programs, 1989-2001

Location No field work

Proposer. Robert Spies

Proposer Affiliation NOAA

Lead Agency NOAA

Funding Recommendations

FY04 \$201,700 00

FY05 \$0 00

FY06 \$0 00

Abstract

This project is synthesizing the results from 12 years of post-spill study in the EVOS damage assessment and restoration programs in the context of anthropogenic and natural factors causing change in the northern Gulf of Alaska ecosystem. The results of the work will be an integrated synthesis book. The book will consist of three major sections: 1. The basic structure and function of the ecosystem, 2. How does it change over time and in response to disturbances? and, 3. The effect of the spill, a summary of the spill effects and recovery as well as how our understanding of the ecosystem has matured and what future path will help us better understand this valuable marine ecosystem? The book will be a major product of the EVOS restoration program and help set the foundation for the Gulf Ecosystem Monitoring Program.

STAC Recommendation

This proposal is to continue funding to write a book of "Synthesis of the ecological findings from EVOS". This project proposes to do more than just summarize work that has been done. It actually proposes to produce synthetic results from EVOS-funded and other relevant research. Specifically they propose to have four sections in the book: (1) Structure and function of the ecosystem, (2) Ecosystem changes, (3) Effect of the spill, and (4) Implications. This synthesis directly answers the invitation Part A Synthesis. As structured the Invitation asks for individual syntheses for each of the habitats, however, this overall ecosystem synthesis is definitely needed. The writing has been divided among a core writing team, members of which have been contracted to write and oversee specific components of the book. All of the members of the team are well-respected scientists. In addition to Bob Spies, the rest of the team consists of Gordon Kruse, Ted Cooney, Tom Weingartner, Alan Springer, Jeep Rice, and Jennifer Allen. Unfortunately, this proposal seems to have fallen under the list of proposals submitted last year for multiple years, but that still need to submit a proposal this year. As such, the proposal as submitted is basically the same one from last year. It does not represent the progress that has been accomplished. The proposal does not even include a current version of the book outline with assignments among team members. There is no budget, just one large number. Fund contingent upon receipt and approval of detailed proposal including milestones, time line and budget.

Executive Director's Recommendation

The project is to complete an ongoing synthesis of past work from the Restoration program which is expected to be an important tool for GEM program planning. The proposal has been revised to incorporate milestones, timeline and detailed budgets, and a current outline of the manuscript. Fund contingent on receipt of the most recent draft of the manuscript.

Project Stabeno-FY04-Bottom Up Control

Project Title Surface Nutrients over the Shelf and Basin in Summer - Bottom up Control of Ecosystem Diversity

Location Yakutat to Kodiak Island/Shelikof of Strait

Proposer Phyllis Stabeno

Proposer Affiliation NOAA

Lead Agency NOAA

Funding Recommendations

FY04 \$49,500 00

FY05 \$0 00

FY06 \$0 00

Abstract

This proposal is for continuation of Project 030654 funded in FY03. Our goal is to better understand the extraordinary variability of nutrients (spatial, interannual and decadal), and factors controlling nearshore communities and zooplankton and juvenile salmon distributions in the northern GOA. We propose monitoring nitrate over the shelf and basin. Underway samples will be collected as part of the NMFS-OCC/GLOBEC salmon survey in July/August of 2004. This survey includes a transit across the central GOA and 10 cross-shelf oceanographic and juvenile salmon transects from Yakutat to Kodiak Island. This will be the broadest nutrient survey of the northern GOA. Nutrient maps will be used to support NPZ models and satellite-derived models of nitrate and new production, to examine mechanisms of nutrient supply such as mixing over banks and transport up submarine canyons, and to assist resource management of salmon and other commercially important species.

STAC Recommendation

Stabeno and Mordy propose to carry out another surface mapping of nutrients in the Gulf of Alaska in July/August 2004. This will add another seasonal snapshot of nitrate over the central Gulf of Alaska and shelf that will be combined with other fisheries and plankton sampling that we be gathered underway during the annual NMFS/OCC/GLOBEC cruise. This will be the second year of these cruises. It is a relatively inexpensive add-on. I am not as optimistic as the proposers as to the usefulness of these data on determining decadal and interannual nutrient variability. These annual snapshots are aliased and could easily lead to erroneous results and conclusions. Their proposed work to determine seasonal and interannual variability of nutrients here needs to have a finer temporal resolution. This is a highly leveraged program and the investigators are very productive. Fund.

Executive Director's Recommendation

The proposal offers to continue a highly cost effective partnership with GLOBEC to investigate the transfer of fertilizer (nitrate) from deep ocean areas to nearshore areas where it can drive production of birds, fish and mammals. Fund.

Project Thorne-FY04-Seafood Waste Discharge

Project Title Impacts of Seafood Waste Discharge in Orca Inlet, Prince William Sound

Location Orca Inlet, Prince William Sound

Proposer Richard Thorne

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$72,680 00

FY05 \$111,692 00

FY06 \$108,943 00

Abstract

This proposal brings together several entities with concerns over the impacts of seafood waste discharge into Cordova Harbor (Orca Inlet). The Prince William Sound Science Center (PWSSC) is acting as the facilitator of this effort because of its strategic location and long-term interest in the problem. Primary collaborators are DEC, ADF&G and Cordova seafood processors. Anticipated collaborators include the Native Village of EYAK and the City of Cordova. The proposed research will investigate possible impacts seafood waste discharge through a series of experiments that will evaluate the nearshore community response to alternate techniques of seafood waste discharge, including different grind sizes and whole carcasses, as well as a pile remediation study. These experiments will not only aid our understanding of the historic impacts, but will form the basis for a more healthy and productive approach to seafood waste recycling. A three-year project is proposed, with the first year devoted to baseline observations and experimental design.

STAC Recommendation

This proposal brings together several entities such as the Alaska Department of Environmental Conservation (ADEC), the Alaska Department of Fish and Game (ADFG), Cordova seafood processors, the Native Village of EYAK, and the City of Cordova with concerns over the impacts of seafood waste discharge into Cordova Harbor (Orca Inlet). The research would investigate possible impacts of seafood waste discharge through a series of experiments by evaluating the nearshore community response to alternate techniques of seafood waste discharge. The results of the research would aid the understanding of historic impacts and form the basis for a more healthy and productive approach to seafood waste recycling. The first year of the proposed 3-year project will be devoted to baseline observations and experimental design. This collaborative project addresses two invitation categories: Community involvement and nearshore. The study would also provide information for similar concerns in southeastern Alaska and complement ongoing ADEC studies in Ketchikan. The PI should consider application of these findings to the wider GEM area. Fund.

Executive Director's Recommendation

The proposal would add the dimension of human effects to the development of the nearshore monitoring program, and it is a good match of GEM objectives to the management of an important pollution concern for coastal communities throughout the oil spill affected area. Fund.

Project ***Vaughan-FY04-Hinchinbrook Entrance***

Project Title Monitoring the Exchange between Prince William Sound and the northern Gulf of Alaska at Hinchinbrook Entrance, submitted under the BAA

Location Prince William Sound, AK

Proposer Shari Vaughan

Proposer Affiliation NGO

Lead Agency NOAA

Funding Recommendations

FY04 \$81,799 00

FY05 \$0 00

FY06 \$0 00

Abstract

One of the least understood physical processes that influences the biological components of Prince William Sound (PWS) is the exchange between PWS and the northern Gulf of Alaska (NGOA). The main objective of this proposal is to document seasonal and interannual changes in the flow patterns at Hinchinbrook Entrance, and to identify and understand the processes responsible for these changes. Support is requested for continued deployment of an upward-looking ADCP mooring in Hinchinbrook Entrance to create a time series of currents from October 2003 to July 2004. The mooring will be equipped with a CTD to create a time series of deep temperature (T) and salinity (S). To identify the dominant factors that govern the PWS/NGOA exchange, the mooring velocity and deep T/S time series will be combined with meteorological time series, numerical circulation model simulations, and physical data collected under previous and existing research programs in PWS and the NGOA.

STAC Recommendation

Vaughan proposes to continue the installation of an upward looking Acoustic Doppler Current Profiler in Hinchinbrook Entrance to measure the exchange of water between the Gulf of Alaska and Prince William Sound. Since Prince William Sound might be an important nursery for much of the Northeast Pacific, this is an important problem in addition to being vital for understanding PWS and the impact of EVOS. This plan is seriously flawed. There is no explanation as to why she continues to not sample from July to October other than she needs to turn the instrument around. This could be done in a couple of days and since she is using a short term charter vessel, the ship time should not be a problem. Increasing the sampling interval to 3 hours from 2 should provide enough reserve power to last for the year. Why is there no plan to continue the observations beyond one year? No prior data were presented but only mentioned in passing. Are they doing repeated ADCP transects across the entrance over the tide cycles rather than just at two stages of the tide? How did they measure the Ekman transports? She really needs an ADCP in the upper layers to get both the baroclinic and Ekman transports. The PI acknowledged the previous critiques of the EVOS/STAC but discounted them and did not include them in this proposal. On the plus side, it is relatively cheap and well leveraged. There is not a great deal of published work coming out of this group and they have not had a very good record of cooperating with other regional researchers. Do not fund.

Executive Director's Recommendation

The project addresses the important objective of measuring how much water is exchanged between Prince William Sound and the Gulf of Alaska, however the methods do not offer the best

available solution to the problem. The project is needed but it can only move forward in the context of partnership with other parties, including UAF, PWSRCAC and OSRI/PWSSC, who can help resolve the technical problems identified. Defer.

Project Walker-FY04-Marine Derived Nutrients

Project Title Presence and Effects of Marine Derived Nutrients (MDN) in Stream, Riparian and Nearshore Ecosystems on Southern Kenai Peninsula, Alaska

Location

Proposer Coowe Walker

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$150,200.00

FY05 \$153,400.00

FY06 \$149,700.00

Abstract

Marine derived nutrients and carbon (MDN) delivered by salmon and other anadromous fishes are considered important drivers in riverine ecosystems, providing nutrients and food to these land-based food webs. However, we know little about the relative value of MDN compared to other nutrient and carbon sources (e.g., watershed-derived) in the Gulf of Alaska region. The objectives of this study are to develop a water chemistry proxy for monitoring salmon returns, and to track and measure MDN effects in stream, riparian and nearshore environments, on the southern Kenai Peninsula. We will accomplish this by linking stream chemistry, marine isotope signatures, marine terrestrial fatty acid ratios, and key animal and plant community density, growth, and lipid measures along a gradient from river mouth to headwaters in key watersheds. This study will be integrated with related studies proposed in other areas of southcentral Alaska to develop a broader regional understanding and widely-applicable long-term monitoring program for the GEM region.

STAC Recommendation

The proposal provides clear and workable approaches to collecting the data necessary to meet the needs identified for watersheds in the Invitation. It would provide geographic and physical contrasts between two (anadromous and non-anadromous) peat wetlands watersheds on the southern Kenai Peninsula, and it would establish a partnership with a resource management agency (ADFG) for operation of a salmon counting weir. Measures C, N, and S stable isotopes, and evaluates full suite of water quality measures containing N, P, C in resident fish, invertebrates and plants. Incorporates direct and re-mineralization routes of C and N through food webs. The proposal would have the ability to compare streams with and without salmon, and to look at production of salmon in a system where escapements are counted (Anchor River tributary). Measures of longitudinal distributions of MDN from headwaters to mouth would provide an important contrast. Measures of proxies cover water chemistry parameters and fatty acid levels and ratio of omega-3 fatty acids to total fatty acids in animals. Excellent ties to local community through Citizens Environmental Monitoring Program, (CEMP is EPA/ADEC funded). Prospects are good for learning how to measure and interpret linkages of coastal peat wetland stream systems to the marine environment in the Gulf of Alaska in ways that will have practical applications of very large potential significance. Fund contingent on a letter from the Principal Investigators agreeing to participate in a watershed workshop will be held at the January 2005 GEM meeting, and to present an up-to-date report on progress and participate in comparison and evaluation of methods.

Executive Director's Recommendations

Proposal provides a resident stream fish dimension to the watershed habitat type. PI has agreed to participate in a watershed workshop which will be held at the January 2005 GEM meeting, and to present an up-to-date report on progress and participate in comparison and evaluation of methods. Fund

Project **Wang-FY04-Building the GEM Infrastructure - Jia Wang**

Project Title Building the Infrastructure Necessary to Create, Develop and Maintain the GEM Model

Location GOA including PWS and Cook Inlet

Proposer Jia Wang

Proposer Affiliation Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$0 00

FY05 \$0 00

FY06 \$0 00

Abstract

We propose to build the modeling infrastructure of GEM by developing high resolution circulation and lower trophic level ecosystem models for the northern Gulf of Alaska (Kayak Island to Shumagin Islands) with boundary conditions provided by an existing set of spatially nested models which span the entire North Pacific (grid resolutions range from 3 – 40 km). We propose to use the extant ROMS (s-coordinate) and MITgcm (MOM3-based, z-coordinate) with a resolution of 1 km, which resolves the eddy field (radius of deformation = 8-10 km) and small-scale embayment and topographic features. Both models will accommodate tidal and subtidal dynamics (and their interactions). Hindcasts of circulation, temperature, salinity, velocity, vertical diffusivity and particle tracks from these models will be made available through the web. Furthermore, hindcast fields can drive passive float tracking models, contaminant models, ecosystem models, and individual-based models of threatened species to aid focused studies by EVOS/GEM researchers. Such model results can serve to diagnose observations from moorings, CTD surveys, and drogued drifters, and those data serve to calibrate/verify the models themselves. A large body of data, gathered by colleagues under support from related programs (e.g. GLOBEC, SSLI, SEBSCC) presently exists for the Gulf of Alaska. We will extend our ability of the modeling effort to bring together data from ongoing programs, observational programs. Following the development of the circulation models and model-data validation, model intercomparison and sensitivity studies will be conducted.

STAC Recommendation

The state-of-the-art modeling effort described in the proposal is eventually certain to be useful to GEM, however the proposal is not responsive to the invitation call for developing an infrastructure supportive of developing the GEM model. There is little in this proposal that addresses infrastructure. Rather this is a proposal for basic science to nest a high-spatial resolution model inside existing circulation models for the North Pacific, which is well ahead of the current GEM needs. What exactly is to be learned from the progression of nested physical models in an ecosystem context is not well specified. Further the proposal does not address the need for “interdisciplinary cooperation and partnerships etc.” as the proposed team is not well balanced from an interdisciplinary stand point, as it is heavily physical and only lightly biological. Do not fund.

Executive Director's Recommendation

The proposal did not provide a compelling response to the need to establish a process for building the GEM Model as identified in the Invitation for Proposals. Do not fund.

Project Weingartner-FY04-Alaska Coastal Current

Project Title Long-Term Monitoring of the Alaska Coastal Current

Location Gulf of Alaska Shelf offshore of Resurrection Bay

Proposer Thomas Weingartner **Proposer Affiliation** Alaskan University

Lead Agency ADFG

Funding Recommendations

FY04 \$75,482 00

FY05 \$75,482 00

FY06 \$75,482 00

Abstract

This proposal is for monitoring temperatures, salinities, and spring bloom characteristics of the Alaska Coastal Current (ACC) from a mooring and monthly sampling at station GAK 1 near Seward. The project builds upon the 33-year record at this station. These data can predict ACC (baroclinic) transport anomalies so this variable is obtained indirectly. The results will be examined with respect to variations in terrestrial runoff and atmospheric heat fluxes. We will provide daily maps of satellite scatterometer-derived winds, make these available to the public via a website, and archive them for future analyses. All variables affect biological production at higher trophic levels. The results have value for interpreting continuous plankton recorder data to be obtained from ferries under GEM sponsorship, evaluating performance of numerical ocean circulation models, and conducting retrospective analyses of biological productivity. Logistics costs are shared with the NSF-NOAA funded GLOBEC program.

STAC Recommendation

Weingartner proposes to continue the 33 year hydrographic time series, maintain a mooring and provide daily wind estimates for the northern Gulf of Alaska. He will also measure fluorescence and light transmission to estimate the primary production. He suggests that it will only be the spring bloom estimates rather than the entire year due to potential biological fouling of the instruments. The GAK1 measurements are vital for the determination of ocean climate conditions. The proposal is well written and Weingartner is productive. The basic work should be funded. The inclusion of the daily wind field processing is questionable. Why would mariners be interested in today's (prior) winds rather than the predictions that are provided by the NWS? Providing real time winds is not a primary function of this program or an academic institution. Also, why are nitrate sensors not included in the mooring? These should prove to be more valuable than quasi-real-time winds. The leverage provided for this project is excellent and the requested costs are modest. Why isn't the request for multiple years rather than just one year? Recommend continued funding this project. This project has repeatedly proved its value to the scientific community in the Northern Gulf of Alaska. Recommend funding at this level for FY04, FY05 and FY06.

Executive Director's Recommendation

The project has proven to be a cost effective partnership to enhance the value of one of the oldest time series of marine environmental data in the North Pacific. Proposal is to be funded at this level with these objectives for three years, FY 2004 - 2006. Fund.

Project **Willette-FY04-Monitoring ACC Dynamics**

Project Title Monitoring Dynamics of the Alaska Coastal Current and Development of Applications for Management of Cook Inlet Salmon

Location Cook Inlet

Proposer Mark Willette

Proposer Affiliation ADFG

Lead Agency ADFG

Funding Recommendations

FY04 \$89,800 00

FY05 \$68,000 00

FY06 \$27,900 00

Abstract

This project will use a vessel of opportunity to collect physical oceanographic and fisheries data along a transect, across lower Cook Inlet from Anchor Point to the Red River delta. Logistical support for the field sampling will be provided in part by the Alaska Department of Fish and Game which has chartered a vessel annually to fish along this transect each day during July providing in season projections of the size of salmon runs returning to the inlet. The work proposed here is for long-term monitoring of oceanographic conditions in Cook Inlet as part of these ongoing fisheries surveys. Investigators will also use physical oceanographic data collected by the project to improve management of Cook Inlet salmon through improved in season salmon run projections. Several hypotheses regarding effects of changing oceanographic conditions on salmon migratory behavior will be tested. The oceanographic data collected by the project will also provide for valuable validation of remote sensing products, improved understanding of ocean dynamics in lower Cook Inlet, and a highly powerful statistical evaluation of the oil spill risk analysis models.

STAC Recommendation

Contributions to the central GEM goal, recurring ecosystem status evaluations, will be continuation of the salmon stock data series for Cook Inlet. ADCP results will be collected on a schedule that is not necessarily coordinated with the tidal periodicities of flow in the Inlet. No scheme for “de-tiding” the data is proposed, but even if one is found, the weak, low-frequency signals of ACC flow may be difficult to extract from the transect series. CTD data may help to define water sources, however an explicit scheme for doing that needs to be laid out. Coordination with inlet CODAR (shore-based radars measuring nearsurface currents) programs is proposed, but availability of CODAR systems in '04-'06 is stated to be quite uncertain. Willette, a fisheries biologist for ADFG, and Pegau, a physical oceanographer at Kachemak Reserve, are competent and will get what can be gotten from the data. A proposal to run more transects for just physical data in some other months (October, January, April?) would give the data set some comparisons, a basis for writing up the results.

The important component of this proposal is testing hypotheses of the effect of the physical oceanography on the salmon fisheries of Cook Inlet. It remains to be established if the Anchor Point July transect is where long-term monitoring for GEM is desired. However, while this evaluation is occurring, the project should provide some short-term payoff by directly relating real-time physical oceanographic conditions and movement of fish for management purposes. Continuous fixed-point measurements of physical data are needed to go with the observations proposed to be collected in this proposal. These continuous physical data should assist with de-tiding data. Funding half of the vessel charter is a significant funding policy question. Is this a normal agency expense that should be paid for as part of this project? Fund contingent on addressing STAC technical concerns and resolution of policy issue on funding transect.

Executive Director's Recommendation

The proposal builds physical data collection into a long established (1979) fishing transect at Anchor Point in Cook Inlet. Anchor Point is at the biologically critical juncture of Gulf marine waters and glacially silted freshwater runoff. Proposal also provides an important link between salmon fishery management and physical oceanography that is expected to provide substantial benefits to economic development and enhanced recreational fishing opportunities in the oil spill affected areas of Cook Inlet. Funding a portion of the transect expenses is a fair distribution of responsibilities in our partnership with ADF&G which changes the uses and configuration of the vessel from a fishing charter to a joint fishing and oceanography charter. A revised proposal addressing STAC technical concerns was received. Fund.