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

Project Number:	030600
Restoration Category:	Monitoring, Research
Proposer:	Robert B. Spies, EVOS Chief Scientist, Applied Marine Sciences, and collaborators
Lead Trustee Agency:	Alaska Department of Natural Resources
Cooperating agencies:	None
Alaska SeaLife Center:	No
Duration:	2nd year, 3 year project
Cost FY 03:	$215,900
Cost FY 04:	$184,800
Geographic Area:	No field work
Injured Resource/Service:	All resources

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 respond to disturbances? and, 3. The effect of the spill: 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.

INTRODUCTION

The effort being proposed is a synthesis of the main scientific findings from the EVOS Restoration Program, with an emphasis on what new has been learned about the affected ecosystem, particularly the variability in this ecosystem in response to the spill and to natural factors. It will be based mainly on the products of the scientific studies following the spill and will cover the period of 1989 to 2001, with reference of course to literature covering earlier ecosystem responses and significant findings from non-EVOSTC studies. Publications, final reports and data will be evaluated to determine what can learned about human and natural forcing factors in the spill area ecosystem.

The following is a brief summary of FY 2002 activities to date (4/15/02). The final consideration of this project for funding was deferred from the August 2001 meeting of the Trustee Council to the December 2001 meeting. The project was approved at the later meeting. The contract between ADNR and Applied Martine Sciences for this project was signed in February 2002. A meeting was held of all the major collaborators in Anchorage late in February 2002. At the meeting the structure, approach and general flow of topics in outline of the book was agreed to by the participants. Particular emphasis was given to integration of the subject matter and collaboration of contributors within the major sections or chapters of the book. Also, all agreed that the book should be written in a manner that would appeal to and be understood by the educated non-scientist. Among other implications this placed a greater emphasis on imaginative graphics and straight forward presentation of concepts, keeping scholarly elaboration and qualification to a minimum. The other major objectives for FY 2002 are also being addressed. The relevent publications are being gathered and inventoried. In addition, an approach is being formualted for a proposal to potential publishers for the book.

NEED FOR THE PROJECT

A. Statement of the problem

The proposed long-term monitoring and research program for the northern Gulf of Alaska (GEM) is best put in place on a solid foundation from previous intensive work in the ecosystem affected by *the Exxon Valdez* Oil Spill. With over 300 separate research projects addressing all major ecosystem components for 12 years, and many simultaneous studies that potentially captured large-scale variability in various ways, and with major ecosystem studies now completed, but with minimal interaction between them, the foundation has been laid in the damage assessment and restoration programs for a comprehensive synthesis. And, with at least some GEM activities due to start in FY 2003 and to expand

slowly over the first 5 years of the program, the time for a synthesis is in FY 2002-2004.

One of the primary needs for this synthesis includes an update of the current conceptual model of ecosystem forcing that is contained in the Gulf Ecosystem Monitoring Program Plan; GEM 2001 (www.oilspill.state.ak.us).

Since the occurrence of the spill much has been learned about long-term ecological change in the north Pacific, both due to human activities and due to climate variability. The efforts to ascribe ecological change to particular causes over the last 12 years have been focused on various aspects of the ecosystem and have produced over 300 publications by Trustee Council scientists and an almost equal number form Exxon-sponsored studies. Recent analyses of multiple biological and physical data sets indicate that large-scale climate-induced shifts occurred in the North Pacific in 1977 and 1989 (Hare and Mantua, 2000). Another change may be underway starting in 1999 or 2000. These changes, particularly the change in mid-1970s corresponded with profound changes in the production of some fish stocks (Francis et al., 1998). Both of these shifts likely had consequences that interacted in unique ways with the massive damage from the *Exxon Valdez* oil spill and the subsequent recovery of the ecosystem.

B. Rationale/link to Restoration

Beginning in 2003 a new phase of the restoration process will start, long-term monitoring supported by the Restoration Reserve. This effort, the Gulf Ecosystem Monitoring Program (GEM) has as one of its main goals detection of natural and anthropogenic change in the ecosystem. The program will be based on a conceptual model that describes how the ecosystem works and how it varies with external forcing factors, both natural and human. The program is being designed so that this model will change as our knowledge of the Gulf of Alaska matures and deepens. Ecological insight that can inform this conceptual model will be especially useful in the next several years. The National Research Council (NRC) is conducting a review of the proposed program and plan. One of their main recommendations is to build GEM on a good understanding of what has been learned from the last 12 years. In order to do this, the NRC and many scientists familiar with the Restoration Program have suggested that a comprehensive scientific synthesis be performed, with special emphasis on what has been learned from EVOSTC research.

C. Location

There is no field work being proposed for this project. The outcome of this study should contribute substantially to GEM and eventually to a better understanding

of the ecosystem on which the coastal communities of the northern Gulf of Alaska depend.

COMMUNITY INVOLVEMENT AND TRADITIONAL KNOWLEDGE

We will interact with regional communities and subsistence users principally in two ways. First, In the first year of the project all of the community facilitators, and the Chugach Regional Resource Commission will be contacted during the information gathering phase of the project. They will be invited to contribute to the synthesis. Secondly, during the completion of the work a multimedia display will be developed to explain the findings of the study in understandable terms and presentations made at those communities that wish to participate.

PROJECT DESIGN

A. Objectives

The project has the following objectives for FY 2002:

The objectives for FY 2003 are to:

A, Do the bulk of the writing of the synthesis.

B. Formulate and begin to execute a plan for graphics based on the outline, text and consultation with the chapter contributors.

C. Hold a meeting mid-year of the P.I.s to discuss progress on component chapters and to integrate approaches and effort the book.

D. Complete rough drafts of the component chapters of the integrated synthesis.

The Objectives for FY 2004 include:

1. Exchange drafts for internal review by synthesis team, make recommendations for change and revise chapters.

2. Make a multimedia presentation for the public.

4. Obtain outside peer review of revised rough draft.

5. Submit synthesis to the publisher.

B. Methods

The methods for conducting this synthesis are those employed in a large scholarly undertaking. They can conveniently be broken down into the following steps:

1. *Gathering the relevant information*. All of the EVOS final reports are in the office of Bob Spies, who will serve as Principal Investigator and editor. These reports are also available as PDF reports online at www.dtlcrepository.downlegal.com/ARLIS-/PDF. Many of the publications from the scientific literature are also available in Spies's office, at ARLIS, or at the EVOS Restoration Office in Anchorage. Bibliographies of Trustee- and Exxon-sponsored studies is kept by the EVOS Restoration Office. Publications will be gathered and distributed by administrative staff at Applied Marine Sciences (AMS). ARLIS, the natural resources library in Anchorage, is available to support this phase of the project. AMS also subscribes to Cambridge Scientific Abstracts, an online service that provides literature searches returning full references for publications and their abstracts. Each of the contributing authors will be asked to keep a reference list using Endnote or another mutually agreed upon software package. These lists will be exchanged between authors and the editor to identify additional literature.

2. *Evaluation.* Each of the contributing authors will read the appropriate reports and publications, examine the relevant data sets, and then evaluate them with regard to anthropogenic and natural forces in ecosystem change. Contributing authors will be asked to take notes on phenomena reported by the authors of the primary literature that may be the results of system forcing.

3. *Initial synthesis meeting*: Early in the project, in the spring of 2002 and before the initial evaluation of the literature takes place, all of the contributing authors will meet and discuss innovative ways to approach the synthesis. It is likely that some approach based strongly on ecosystem processes will emerge given the backgrounds and initial discussions among the team. Writing assignments will be made during this meeting. It is envisioned that each chapter in the synthesis will have a lead author and others that contribute in order to have the maximum degree of sythesis.

4. *Chapter outlines*. Following the meeting, an outline of each of the chapters will be produced and a reference list will be circulated among the entire synthesis team. These lists will be reviewed and revised in light of any comments provided. The outline for the integrated synthesis will then be finalized.

5. *Obtaining a publisher.* The leading potential book publishers will be contacted to determine their interest in the synthesis based on the outline. A publisher will be chosen and negotiations for publications will be undertaken.

6. *Manuscript preparation*. The individual authors will write their chapters based on the outline. The editor will hold periodic conference calls and at least one face-to-face meeting per year will be held.

7. *Initial review*. Draft manuscripts will be exchanged among authors and with the editor during the first part of FY2003 for review.

8. *First revisions*. Review comments from authors and the editor will provide a basis for the first revision. The editor will monitor progress and encourage completion as the deadline for revisions of the drafts approaches. At this stage we will contract with an independent science writer to suggest changes to make the book more accessible and engaging for the non-scientist.

9. *Independent review*. Outside reviewers will be enrolled to review the revised manuscripts and provide written comments.

10. *Final revision*. The final revisions will be incorporated and the manuscripts submitted for publication.

C. Organization

The following is the revised general outline for the book. :

1. Introduction
2. Ecosystem structure and function.
    - physical processes and forcing, currents and tides, eddies and fronts
    - nutrient cycling and transport
    - biological processes and productivity

3. Ecosystem change
    - description of long-term changes in the ecosystem
        - pre-spill
        - post-spill
    - correlative associations
    - mechanisms

4. Summary of synthesis, including a revised conceptual model for GEM

D. Cooperating agencies, contracts, and other agency assistance.

The Principal Investigator is an employee of AMS, which is proposed as the prime contractor for production of this synthesis. All of the other author contributions will be written on fixed price contracts with the authors contracted as consultants to AMS.

SCHEDULE

A. Measurable project tasks for remainder of FY2002 (informational) and FY2003 (proposed)

July 2002	Preliminary chapter outlines completed and list of references assembled
August 2002	Book outline finalized
September 2002	First drafts of chapters initiated
November 2002	Negotiations with a publisher completed
February 2003	Second meeting of synthesis team for integration
June 2003	Rough drafts of all chapters due
August 2003	Completion of internal reviews of chapter rough drafts
September 2003	Chapter reviews redistributed to authors with recommendations for revision
December 2004	Multimedia presentation completed
March 2004	Revised chapters due from authors
April 2004	Start of external review of chapters
June 2004	External chapter reviews due, distribute to authors
August 2004	Final revised chapters due
September 2004	Send entire manuscript to publisher

B. Project milestones (see schedule above)

C. Completion date

The project will be completed in September 2003.

PUBLICATION AND REPORTS

The manuscript for book will be produced at the end of the three-year period. The title will be decided at a later date.

PROFESSIONAL CONFERENCES

The P.I. requests travel to one professional conference in 2003 to present the results of the synthesis effort and travel expenses to one annual EVOS meeting for each of the authors.

NORMAL AGENCY MANAGEMENT

Not applicable, as none of the authors is from an agency.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Coordination will be through the Office of the Chief Scientist working with the staff of the Restoration Office and ARLIS to obtain the materials necessary to complete the proposed work.

EXPLANATION OF CHANGES

The following changes have been made in the proposal approved by the Trustee Council in December 2001:

1. The outlline has been changed as a result of the first meeting of the collaborators. It is now organized into the introduction three major chapters dealing with ecosystem structure and change and a revision of the GEM conceptual model.

2. It has been decide to write the book in such a way as to make it very interesting and readable for an educated non-scientitst. This will involve making the presentation of the material concise with abundant support by imaginative graphics.

3. In order to keep the cost of publishing the book and its price reasonable, we will have to have a copy-ready manuscript available to the publisher rather than just a standard manuscript text. This will require that more of the internal funds be available for document preparation and text-graphics integration. This was consensus opinion at the first meeting of the writing team.
4. We have invited Dr. Gordon Kruse of the University of Alaska to join the team to add expertise in fisheries, crustaceans and fisheries management. This was also a consensus opinion at the first meeting of the writing team.

PROPOSED PRINCIPAL INVESTIGATOR

Robert B. Spies, Ph.D.
EVOS Chief Scientist
Applied Marine Sciences
4749 Bennett Dr., Suite L
Livermore, CA 94550
Phone (925) 373-7142
Fax (925) 373-7834
e-mail address: spies@amarine.com

Principal Investigator

Dr. Robert B. Spies has a Ph.D. from the University of Southern California (1971). He has over 30 years of expereince in marine science. He has been Chief Scientist to the EVOS Trustee Council since 1990. In that role he has reviewed all of the reports for the many scientific projects conducted following EVOS, conducted numerous workshops to identify gaps in studies of natural resources impacted by the spill, and has reported to the Executive Director and the Trustee Council on the status of the impacted ecosystem on a regular basis. Dr. Spies is also past editor of *Marine Environmental Research* and serves on its Editorial Board. He also serves on the Editorial Board of *Aquatic Toxicology*. He has over 40 publications on marine ecology and ecotoxicology.

Other key personnel

Dr. Thomas Weingartner. Dr. Thomas Weingartner is an observational physical oceanographer on the faculty of the University of Alaska's Institute of Marine Science. For the past twelve years he has conducted research in the seas and oceans surrounding Alaska, including the Gulf of Alaska, Prince William Sound, and the Bering, Chukchi, and Beaufort seas. He is currently a Principal Investigator in the Gulf of Alaska GLOBEC program. His research interests include the effects of physical environmental variability on marine ecosystems.

Robert T. Cooney received his doctoral degree in Biological Oceanography from the University of Washington, Seattle (1971). He joined the faculty of the University Alaska Fairbanks and studied the plankton communities of Alaska waters for 30 years. His specialties include zooplankton assemblages found in coastal, shelf and oceanic waters of the northern Gulf of Alaska and Bering Sea. Dr. Cooney has had extensive experience with food-webs supporting juvenile pink salmon in Prince William Sound dating back to 1976. Collaborative investigations with the Prince William Sound Aquaculture Corporation and Alaska Department of Fish and Game were responsible for acquiring and using a real-time oceanographic buoy system in the Sound to log seasonal and annual changes in surface ocean climate and plankton. Most recently Dr. Cooney was the Lead Scientist for the EVOS-sponsored Sound Ecosystem Assessment (SEA) study of the post-spill recovery of pink salmon and herring. He is presently helping to revise the Gulf Ecosystem Monitoring program and implimentation studies.

Dr. Stan Rice-Stanley D. Rice has a Ph. D. in comparative physiology from Kent State University (1971). He has 30 years of experience in oil pollution work in Alaska; 15 years of program manager experience at the Auke Bay Lab; 12 years of experience on the *Exxon Valdez* spill. Short and long-term damages, and oil persistence are his primary research areas. Dr. Rice has over 100 peer-reviewed publications on oil effects. These publications include reviews and synthesis articles, covering effects of oil on fish, and specifically effects of oil on pink salmon. He has also contributed to the National Academy of Science reviews of oil inputs and effects. Dr. Rice has 25 papers on other contaminant issues as well.

Dr. Alan Springer has been involved in marine bird and mammal research in the N. Pacific for 25 years. In that time He has conducted studies at numerous breeding sites and at sea from southeastern Alaska to the Arctic Ocean, thereby gaining first hand knowledge of the haunts and habits of seabirds and marine mammals and an appreciation of the needs for and limitations of information on them. He also has broad experience in oceanographic studies and in research with lower trophic levels. As a peer reviewer during development of the APEX study, and as a core reviewer now, he is familiar with studies that have been supported by EVOSTC, as well as by others that are relevant to the goals of this synthyesis. Throughout his career, he has attempted to understand birds, mammals, fish, and plankton in the context of marine food webs and the physical environment. Dr. Springer has published several papers that synthesize large amounts on information on various aspects of the marine ecology of the N. Pacific

Dr. Jennifer Nielsen-- Dr. Nielsen has a Ph.D. from the University of XXX (19XX). Dr. Nielsen has XX years of experience as a geneticist and XXXX. Her work included xxxxxxxxxxxxxxxxxxxxxxx. Dr. Nielsen currently is the xxxxxxxxxxxx, Anchorage, AK.

Dr. Gordon Kruse---

Personnel time allocation

The involvement of the Chief Scientist, Dr. Spies, in the Restoration Program, is declining, particularly with regard to holding reviews and workshops. It is also anticipated that more of the administrative functions for the science program will reside in the EVOS office in FY2002-FY2003 than had previously been the case. Consequently, Dr. Spies will have the time to act as the Principal Investigator for this effort. Dr. Spies will be a very active editor and bring his extensive knowledge of the program to bear. He will be engaging the authors on a variety of issues and suggesting cross-cutting themes in the synthesis.

Literature Cited

Francis, R.C., S.R. Hare, A.B. Hallowed and W.S. Wooster. 1998. Effects of interdecadalk climate variability on the oceanic ecosystems of the NE Pacific. Fisheries and Oceanography7, 1-21.

Hare, S.R. and N.J. Mantua. 2000. Empirical evidence for North Pacific regime shifts in 1997 and 1989. Prog. Oceanogr. 47, 103-145.

Peterson, C. 2001. The *Exxon Valdez* oil spill in Alaska: Acute, indirect and chronic effects on the ecosystem. Advances in Mar. Biol. 39, 1-103.

Project 030600
Year 2 Cost Summary
Prepared by
Applied Marine Sciences, Inc.

Task & Personnel	*Total Hours*	*Rate*	*Cost*	*Total*
SYNTHESIS				
Robert Spies	734	$122.89	$90,200.75	
Diane Stafford	51	$30.67	$1,564.34	
Sue Chase	88	$57.40	$5,051.37	
Stephanie Davis	76	$43.68	$3,319.85	
Nearshore Biologist	50	$100.00	$5,000.00	
Contract Writers	440	$100.00	$44,000.00	
Reviewers	25	$100.00	$2,500.00	
Subtotal			$151,636.31	$151,636
Other Direct Costs				
Travel			15,852.00	
Shipping/Communications			1,023.00	
Graphic Presentations			8,000.00	
Miscellaneous			800.00	
Total Direct Costs				***$25,675***
Total Labor and Direct				$177,311
Gen. and Admin. Overhead	6.40%		$11,347.92	
Fee (5%)			$9,432.96	
TOTAL AMS COST				***$198,093***
		plus ADNR GA (9%)		$17,800
TOTAL COST WITH GA				***$215,900***

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TASK	*AMS Labor Hours*						*Contract Writers /*	
	Spies	Stafford	Chase	Florer	Gunthe	Bell	No.	total hours
EVOS Synthesis								
Plan	44	15		6				
Coordinate	50	12	12	12				
Review	300	18		16				
Stephanie Davis	40		32	36				
Writing	300	6		6				
Contract Writers / Reviewers								
First Draft			44				4	200
Final Report							4	240
Nearshore Biologist							1	50
Reviews							5	25
subtotal	734	51	88	76			14	515
Total Labor Hours	734	51	88	76			14	515

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TASK					
	number	days @ $42	nights@ $115	airfare	Cost
Systhesis Meetings	12	36	36	$10,200.	$15,852.
(2 mtg for RBS + 5 writers)				$0.	$0.
Total	12	$1,512.	$4,140.	$10,200.	$15,852.