19.09.04 (2 of 4)

01210

Approved TC 8-3-00
Revision 7-1-00

Youth Area Watch

Project Number:	01210
Restoration Category:	General Restoration
Proposer:	R. DeLorenzo/Chugach School District
Lead Trustee Agency:	ADFG
Cooperating Agencies:	None
Alaska SeaLife Center:	No
New or Continued:	Cont'd
Duration:	6th yr. 7 yr. project
Cost FY 01:	$107.0
Cost FY 02:	$96.3
Geographic Area:	Prince William Sound, lower Cook Inlet
Injured Resource/Service:	All

ABSTRACT

This project links students in the oil spill impacted area with research and monitoring projects funded by the Trustee Council. The project involves students in the restoration process and provides these individuals the skills to participate in restoration now and in the future. Youth conduct research identified and delegated by principal investigators who have indicated interest in working with students. 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 01 will be Tatitlek, Chenega Bay, Cordova, Nanwalek, Port Graham, Seldovia, Seward, Valdez, and Whittier.

INTRODUCTION

Since the inception of Youth Area Watch, coordination between research and restoration projects and the communities affected by the oil spill continues to increase. Resulting from many factors, community involvement in the restoration process continues to grow and strengthen; Youth Area Watch is an example of this coordinated effort through the connection that students, the communities and researchers maintain. This relationship creates an environment where youth are encouraged to interpret the data collected and apply the information to the ecosystem.

Students from the oil spill impacted communities are screened and selected for participation in Youth Area Watch at the beginning of each school year. Those showing an interest, academic ability and concern for the oil spill effects on local ecosystems are invited to represent their community as a student of the project. Students work with principal investigators of research projects and community facilitators, as well as independently to achieve the set project objectives.

Three core research projects funded by the Trustee Council serve as the central link for all Youth Area Watch activities. Initial cooperating projects include pristane mussel analysis (01195), harbor seal management and biological sampling (01244F) and comprehensive killer whale investigation in Prince William Sound (01012A). These projects continue to work with Youth Area Watch, providing specific research activities for students to conduct and training protocol for those duties. According to protocol, students collect samples and data for the cooperating research and monitoring projects. The samples and data are compiled by a Youth Area Watch project coordinator located in Anchorage and sent on to the principal investigator of the respective projects. Information on the data collected is maintained by the project coordinator for project analysis conducted by the students during group project sessions.

Yearly, students select a local restoration project to conduct. This year, students will begin by completing a planning process during the winter months. Students work with local Community Involvement coordinators to integrate, where possible, their knowledge and expertise.

Students will post project information on their web site (http://www.micronet.net/users/~yaw) for the public to view. This information will be updated throughout the project year.

NEED FOR THE PROJECT

A. Statement of Problem

Youth Area Watch, identified by the Trustee Council as a "general restoration" project, is committed to collecting the requisite samples and data for principal investigators of research projects to make informed decisions concerning the ecology of oil spill impacted areas. Research and restoration project PI's identify needed data collection within the oil spill impacted communities that in many instances can best be facilitated through local involvement of community residents.

Given the finite resources available for project activities, cost containment is necessary. By working with local community youth, information can be collected at a minimal cost. In addition, a greater quantity of data collection from an increased number of sites throughout the year can be accomplished by Youth Area Watch project activities.

As a part of the Memorandum of Agreement and Consent Decree approved by the U.S. District Court, "meaningful public participation in the injury and assessment and restoration process" is recognized as an important component of the restoration process. While there are a variety of instituted mechanisms for this involvement, Youth Area Watch offers positive examples of meaningful public participation expressed by the oil spill impacted communities through the involvement of community facilitators (Community Involvement \052A) and other community-based projects. The project continues to receive strong support both within the communities that it is conducted as well as among the principal investigators involved with the youth.

B. Rationale/Link to Restoration

Community-based participation in ecosystem restoration is supported by recent research. Graduate field ecology work conducted through SUNY, Stony Brook applied co-management principles to revitalize the Oak Brush Plains Preserve of Long Island, New York (Block, p. 38). In this exercise, a local group familiar with the environment assisted in replanting and management efforts while the researcher actively participated in their experiential activities so that cooperative management strategies could best be achieved. This approach is supported by research techniques used in other ecological restoration projects such as fisheries (Pinkerton) and tropical rain forests (Allen). Furthermore, the link between Native cultures and environmental revitalization has gained significant support as a mechanism for sustaining ecological practices within communities (Rogers-Martinez). Given this research, appropriate extension is made to youth within the restoration region so that "the issue of how people will inhabit, utilize and maintain the area in a manner that sustains its integrity" can be addressed (Block, p. 38).

Youth Area Watch is based on the commitment by principal investigators of research and restoration projects to involve students in their work. Participating projects are funded by the Trustee Council and have met the guidelines under the settlement. It is through the

cooperating projects that Youth Area Watch holds an interest in the immediate restoration activities.

As a long-term goal, project activities are expected to provide the foundation for long-term commitment to restoration of the impacted area to pre-spill levels. Involvement of youth in research and monitoring activities is essential in developing local commitment to the restoration plan adopted by the Trustee Council. Cooperating PI's request precise and detailed sampling/data collection from the youth. Students, in turn, have increased their knowledge and participation through their connection to the projects. As a result, students are now stakeholders in the restoration process.

C. Location

While Youth Area Watch is administered through the Chugach School District's main office in Anchorage by project coordinators, project activities currently take place in the nine participating communities and in the oil spill impacted area. Local communities include Chenega Bay, Cordova, Port Graham, Nanwalek, Seldovia, Seward, Tatitlek, Valdez and Whittier.

The science teacher (site teacher) within each of the nine communities oversees the day-to-day activities pertaining to the project. Project coordinators travel to the local communities to facilitate in-class integration of project activities and off-shore research in specific locations of importance to the identified research projects. Local projects activities identified by each site occur at or near the community.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

One of the main goals of Youth Area Watch is to facilitate community involvement in the restoration process at a primary and secondary school age. It is through community interest and participation that the project has had a positive impact on students. Ultimately, long-term impacts, to include local ongoing restoration and ecosystem sustainability, are anticipated as youth conduct established research and apply this knowledge to community efforts to understand and preserve species affected by the oil spill. As a result, communities continue to request participation in Youth Area Watch.

Local oil spill impacted communities are involved and participate in Youth Area Watch. The local facilitators of Community Involvement (/052A) continue to work closely with students and the community Youth Area Watch activities to involve youth. Local facilitators and parents of participating youth assist with various aspects of project activities such as serving as chaperones, providing traditional ecological knowledge and coordinating opportunities for youth to work with local projects. Through this cooperative effort, information is exchanged between projects and across generations.

As a component of the project scope, students at each site are asked to identify a local project that they will conduct. Through these local projects, students gain a greater understanding of what the research and restoration process means at the community level, as well as an interest in meaningful project outcomes.

PROJECT DESIGN

A. Objectives

Selected students from the identified communities participate in research and restoration activities set out by Alaska Department of Fish and Game principal investigators, NOAA staff, University of Alaska, Fairbanks biologists and other project principal investigators working with Youth Area Watch. As part of an area watch project that works with existing research and restoration projects, students collect samples and data that is then provided to the respective projects.

Youth Area Watch objectives include:

1. Research project principal investigators interacting with students.
2. Identifying all research and data collection activities.
3. Updating memoranda of agreement with school districts.
4. Completing site teacher orientation.
5. Conducting school orientations for students on Youth Area Watch.
6. Selecting students to participate in Youth Area Watch.
7. Conducting site teacher training on project activity protocol.
8. Completing the student project orientation and training.
9. Conducting oceanographic data collection.
10. Assisting local hunters/technicians collecting harbor seal biological samples.
11. Conducting a local research/restoration project.
12. Maintaining a Youth Area Watch web site.
13. Collecting blue mussels for pristane/mussel analysis.
14. Facilitating project follow-up training for site teachers.
15. Conducting killer whale monitoring

B. Methods

The Chugach School District currently works with the Kenai Peninsula Borough School District, Cordova School District and Valdez School District through memoranda of agreement so that the communities of Chenega Bay, Cordova, Nanwalek, Port Graham, Seldovia, Seward, Tatitlek, Valdez and Whittier may participate. School districts will operate under the existing agreements during the sixth project year.

Youth Area Watch project coordinators work with the principal investigators of the cooperating projects to solidify project expectations. Protocol is established for

sample/data analysis. In addition, principal investigators commit to working with the students for a period of time during the training and/or data collection stage.

The Chugach School District developed an application and screening tool to select students for participation in the project. Up to 28 students will be selected from the communities to be a part of Youth Area Watch. While the distribution may vary according to the interest and ability of students that apply, it is expected that the distribution will be as follows: two students from Chenega Bay, three students from Cordova, two students from Port Graham, two students from Nanwalek, two students from Seldovia, six students from Seward, three students from Tatitlek, four students from Valdez, three students from Whittier, and one remote site student.

Prior to the beginning of school in the fall, participating Youth Area Watch teachers at the local sites will come together for an orientation session facilitated by project coordinators. It is anticipated that site teachers will again receive protocol training directly from principal investigators. This training will occur at one community site and the training will be videotaped for future referral.

Youth Area Watch relies on the participation of research projects, sites and program resources to successfully fulfill the project objectives. Throughout the project year, students travel to research vessels, specific project sites near their community and research labs in the process of project activity completion. In the past year, Youth Area Watch was able to coordinate with projects conducting research cruises and work cooperatively on task completion while sharing the costs of vessel hiring. In FY99 and FY00, Youth Area Watch coordinators assisted with the coordination of harbor seal protocol training. It is expected that this type of cooperative effort will continue in the present and coming years.

Students will participate in the core research projects as a group. This will consist of coming together as a group to work on collection protocol, as well as conducting activities for these projects in their community. In addition, students will participate in local projects that pertain to their geographic area. It is during the local project work that students receive a high degree of one-on-one interaction and involvement with principal investigators and their research. Youth Area Watch coordinators will continue to be open to working with other projects funded by the Trustee Council if students can have meaningful participation in these projects.

Ongoing Youth Area Watch research and restoration projects include:

1. Pristane/mussel analysis, Project Number 01195. Jeff Short and Pat Harris at the NOAA Auke Bay laboratory study the pristane levels in blue mussels. There are approximately thirty mussel collection sites in Prince William Sound. Students will continue to collect mussels twice a month at sites appropriate for collection according to set protocol. During the fall and winter months, students are responsible for overall

mussel bed seasonal watch. Students will tag, identify mussel bed characteristics and predator/prey activities.

2. Harbor seal management and biological sampling, Project Number 01244F. The project is conducted by Monica Reidel of the Alaska Native Harbor Seal Commission, in cooperation with Vicki Vanek from the Department of Fish and Game in Kodiak. After they have participated in traditional ecological knowledge and protocol training, students will pair up with local technicians/hunters and assist with bio-sampling activities. Students collect different parts of the seal, including the skin, blubber, teeth and stomach. Adherence to sampling protocol is ensured by working directly with the local hunters.

3. Comprehensive Killer Whale Investigation in Prince William Sound, Project Number 01012A. The principal investigator is Craig Matkin. The project tracks the killer whale population in Prince William Sound and Kenai Fjords. Whales are photographed and cataloged based on identifying markings and family relationships. Genetic studies on the whales are also conducted through the use of darting. Students will assist in locating and identifying the whales during day cruises in and around Resurrection Bay.

In addition to the core projects in which Youth Area Watch students participate, each site is selecting a restoration project to work on in their local community. This restoration activity is something that the students select and not necessarily a project that is currently funded by the Trustee Council. However, local projects are closely linked to existing restoration activities.

In FY '00, Youth Area Watch students initiated or continued a variety of local research/restoration projects. The scope and success of student initiated projects seems to increase with years of project experience and has at times been adversely affected by local weather and political conditions. The following is a summary of FY '00 student initiated projects.

Chenega Bay- In Chenega Bay, students worked with a local naturalist to build nest boxes for migratory swallows. This project was student driven from the solicitation of bids for materials to the report to the community when the project was finished. When the boxes were completed, they were deployed around the village so as to provide nesting opportunities for the swallows and viewing opportunities for local residents. A student report on this project is available on the Youth Area Watch Web site.

Cordova- In Cordova, students coordinated with the Prince William Sound Science Center to build several benthic collection apparatus for joint use by the Science Center and the high school. The collection apparatus were constructed and deployed on the bottom of the Cordova harbor to attract and provide habitat for benthic organisms. They can be retrieved as needed to collect samples of those

organisms. During the period of time immediately following the initial deployment of the collectors, they were retrieved on a regular basis to study the rate and type of colonization that occurred. A student report on this project is available on the Youth Area Watch web site.

Nanwalek- This is the first year that Nanwalek students have undertaken a restoration project. They decided to team with an existing Americore recycling project that was occurring concurrently in the village. They focused on developing a village-wide recycling program for aluminum cans. They enlisted the entire school to assist in the collection effort with the goal of recycling the cans and reducing the non-biodegradable mass in their landfill. A student report on this project is available on the Youth Area Watch Web site.

Seward- The students in Seward this year decided to partner with George Divoky to build nesting boxes for pigeon guillimots. The nesting boxes were to be placed in appropriate spots around Resurrection Bay. This project got a late start, and at last check the boxes had been built but a time had not yet been established to go out and mount the boxes. The student report for this project has not yet been posted on the Web site.

Tatitlek- In Tatitlek, students decided to follow up on the project that was initiated in FY '98. In FY '98, students attempted to restore a polluted pond near the boat launching beach in the village of Tatitlek. Local oral records indicate that the pond used to be inhabited by at least one species of frog. Students in FY '98 reasoned that the frogs may return if the obviously polluted pond was cleaned up. In FY '00, the students wanted to revisit the pond to check its status and further research the absence of frogs. They surveyed the pond for plant and animal life but were disappointed to find no frogs. Hypotheses to explain the disappearance of the frogs include inundation by ash from the recent eruption of Mount Redoubt and elimination by severe pollution prior to the initial clean up. There is definitely room here for more work in the future as amphibian populations seem to be in decline world-wide. A student report on this project is available on the Youth Area Watch Web site.

Valdez- In past years, Valdez students have had their local project plans thwarted by bad weather and persistent snow cover in the late spring when they planned to do their project work. This year's group chose to team up with the local visitor center on a project that they knew they could complete regardless of weather. They utilized the industrial technology and art departments at the high school to design and build a double-sided sign welcoming tourists to Valdez. They also produced a pamphlet that posed and answered the "Ten most common questions asked by tourists" as determined by the visitor center staff. A student report on this project is available on the Youth Area Watch Web site.

Whittier- In FY '98, Whittier students established a representative plot on the kittiwake rookery on Passage Canal and monitored it on a weekly basis through the months of April and May. This project has been ongoing for three years now as this year's students chose to continue the work. The students there are attempting to catalog the rate and timing of the return of the kittiwakes each year as well as determine the maximum number of birds on the rookery each year. This project was initiated at the suggestion of personnel from the U.S. Fish and Wildlife Service. The students this year worked under the more direct guidance of Rob Suryan of U.S. Fish and Wildlife Service. Based on their work so far, Rob invited the Whittier Youth Area Watch students to work with himself and the rest of the Fish and Wildlife Service team on their surveys in Shoup Bay next year. A student report on this project is available on the Youth Area Watch Web site.

Coordination between Youth Area Watch and participating research projects remains strong. Where possible, research vessel costs are shared to maximize resources for project activities. In the case of the pristane/mussel project, Youth Area Watch has paid for the biologist's chartered flights to sites for mussel collection to allow students to participate in the process. In other instances, time and resources are contributed by participating projects to Youth Area Watch.

As funding for the Youth Area Watch project comes from increasingly non-trustee sources, and the pool of Trustee Council projects diminishes, the project will transition to include some non-Trustee Council funded projects. This shift will be necessary in order to meet the goals of the original project proposal and provide a long-term role for middle and high school students in research and restoration projects.

Objectives and Activities

Objective 1: Youth Area Watch students will interact with research project principal investigators, gaining a greater understanding of the affects of the oil spill on the ecosystem.

Activity 1: Principal investigators commit to working with students directly at least once during the project year.[1]

Activity 2: Students work beside principal investigators during field work.

Activity 3: Students independently conduct activities set out by the principal investigators.

Activity 4: Students draw conclusions from their independent work to be

[1] It is expected that additional contact occur throughout the project year, though not necessarily in person. Research project PIs receive updates and samples according to the protocol set out for students.

reported at the annual Science Review.

Activity 5: Students work with Community Involvement (/052) local facilitators and community members to increase awareness of restoration activities and the status of the ecosystem.

Objective 2: Project coordinators identify all research and data collection activities to be conducted by students at all sites participating in Youth Area Watch.

Activity 1: Project coordinators meet with the principal investigators or delegate project research personnel either by phone or in person to set student activity parameters.

Activity 2: Activity protocol forwarded by the principal investigator or delegate, including sample and data forwarding process, to project coordinators.

Activity 3: Project coordinators finalize project activities for site teacher and students.

Objective 3: Project coordinators update memoranda of agreement with the Valdez School District, Cordova School District, and Kenai Peninsula Borough School District for participation in Youth Area Watch.

Activity 1: Project coordinators contact each school district to evaluate the current agreement and make any necessary changes.

Activity 2: Site teachers are identified by each school district for the participating communities.

Objective 4: Site teachers receive Youth Area Watch project orientation.

Activity 1: Project coordinators develop an orientation and training session plan in consultation with research project principal investigators.

Activity 2: Project coordinators set a date in the latter part of August to conduct orientation. Site teachers are contacted to determine the most appropriate dates.

Activity 3: Project coordinators perform site teacher orientation and training.

Objective 5: Project coordinators conduct school orientations on Youth Area Watch.

Activity 1: Project coordinator travels to each participating school site prior to beginning the project year.

Activity 2: Project coordinators present Youth Area Watch to community science classes. Students that have participated in prior years will be asked to assist.

Activity 3: Students will be informed of the process to apply and participate in Youth Area Watch '01.

Objective 6: Students are selected to participate in Youth Area Watch.

Activity 1: Project coordinator distributes student applications to project sites. All village council/tribal offices (Chenega Bay, Seward, Tatitlek, Valdez) will receive application forms, as well as the Valdez, Cordova and Kenai Peninsula Borough School Districts for their respective community sites.

Activity 2: Project coordinators convene a committee to review student applications for Youth Area Watch participation. The committee is comprised of Chugach School District staff and may be assisted by participating school district staff and community facilitators (/052).

Activity 3: The review committee examines applications and selects students based on science interests, academic achievement, maturity and site teacher recommendation.

Objective 7: Project coordinators conduct site teacher training on project activity protocol.

Activity 1: Project coordinators set a date in late September for site teacher protocol training and coordination

Activity 2: Project coordinators request the attendance of research project principal investigators at the site teacher orientation.

Activity 3: Project coordinators facilitate a protocol training session to ensure that correct information and research practices are followed by students during the project year.

Objective 8: Project coordinators complete the student project orientation and training. All participating students from the community sites collectively meet at the Seward SeaLife Center for the Youth Area Watch introduction and preliminary activity participation.

Activity 1: Project coordinators work with SeaLife Center staff to determine appropriate dates for orientation.

Activity 2: The project coordinators invite research project principal investigators to participate in the student orientation.

Activity 3: The Youth Area Watch principal investigator coordinates travel arrangements for student participation in the orientation.

Activity 4: In cooperation with the research project principal investigator(s), project coordinators conduct the student orientation to Youth Area Watch goals, responsibilities and activities. Students learn about the ecosystems, and identify ways in which project activities fit into the biotic cycle.

Objective 9: Students conduct oceanographic data collection in their local communities. Site teachers oversee these activities.

Activity 1: Students take monthly water temperature and depth readings at their local site.

Activity 2: A weather station is installed at each site under the supervision of the site teacher. Students measure the wind speed and direction, air temperature and barometric pressure.

Activity 3: Data is collected at each site and transmitted to the project coordinator periodically.

Activity 4: Data is posted on the Youth Area Watch web page by the project coordinators

Objective 10: Students assist local hunters/technicians collecting harbor seal biological samples.

Activity 1: Project coordinators work with principal investigators to coordinate harbor seal biosampling trainings for students and local hunters.

Activity 2: Students analyze an available sample to become acquainted

with what is taken and what to look for in a sample. Students collect various parts of the seal for analyzing, which include: skin, blubber, teeth, stomach, skull, liver, heart and kidney. Additionally, measurements and weight are taken for each animal.

Activity 3: Students at local sites participate in taking samples from harvested seals.

Activity 4: Students assist the hunter/technician in preparing the sample for shipment to the harbor seal management principal investigator.

Objective 11: Each community site conducts a local research/restoration project.

Activity 1: The site teachers and project coordinator work with participating students to identify a local research/restoration project.

Activity 2: During the winter months of November through January, students develop a plan for their local restoration project. This is completed with the appropriate assistance and coordination of community facilitators.

Activity 3: Site teachers work with project PIs where appropriate to develop protocol for student participation.

Activity 4: Students conduct local project activities according to protocol and timelines set out by site teachers.

Activity 5: Students provide data/samples to project PIs according to protocol.

Objective 12: Students maintain a Youth Area Watch web site.

Activity 1: Students become Internet proficient and learn to update their web site with current YAW information.[1]

Activity 2: Students analyze data collected from the research projects, both past and current.

Activity 3: Using the established reporting format, the data is posted on the web site.

[1] While many students will be familiar with the Internet, some communities recently linked will need training. Additionally, previous Youth Area Watch participants may be proficient at updating the web site, yet new students will need assistance.

Activity 4: Students update data on research activities as necessary.

Objective 13: Students at each site collect blue mussels for pristane/mussel analysis.

Activity 1: Students tag and identify mussel bed characteristics during fall and winter months at their local sites.

Activity 2: Students note predator/prey activity at the identified mussel bed sites monthly.

Activity 3: Students collect mussels according to principal investigator request during the spring months. Sites are selected by the principal investigator and noted in project reporting.

Activity 4: Students label and cold storage mussels for transport to the Auke Bay laboratory in Juneau.

Activity 5: Students send mussels to project coordinators once an adequate collection has accumulated for transport to Auke Bay Labs.

Activity 6: Students count mussels in the beds according to set protocol.

Activity 7: Students compile site data for transmission to the project coordinator.

Activity 8: Students travel to the Auke Bay laboratory to participate in the analysis of data.

Objective 14: Project coordinators facilitate project follow-up training for site teachers in the spring.

Activity 1: Project coordinators set a date convenient for site teachers to conduct a spring follow-up session.

Activity 2: Project coordinators invite principal investigators of participating projects to assist in the follow-up session.

Activity 3: Project coordinators facilitate a follow-up session for site teachers to share information and identify strategies for improving student activities.

Objective 15: Students participate in killer whale identification project.

Activity 1: Principal investigators train students in killer whale identification methods. Students are also informed of project scope and goals.

Activity 2: Students participate in a day cruise with principal investigators to track and identify killer whales in and around Resurrection Bay including: hydrophonic monitoring of whales, photographic recording of individual animals, and darting to obtain blubber and skin samples.

C. Cooperating Agencies, Contracts, and Other Agency Assistance

The Chugach School District serves as the administrative agency for Youth Area Watch through their contract with the Department of Fish and Game. The school district has shown that it is an effective link to the students and communities impacted by the oil spill. As the administrative entity, the Chugach School District will maintain memoranda of agreement with the Valdez School District, Cordova School District and Kenai Peninsula Borough School District as the school districts that serve the identified communities.

The Chugach School District continues to work with the University of Alaska in an effort to provide credit for progressively responsible activities and research conducted by students participating in Youth Area Watch. The district views the University of Alaska system as an integral partner in a continuum of active ecosystem awareness and restoration. Through the Native Marine Sciences Program at the University of Alaska Fairbanks, students will have the opportunity to further their understanding of research and restoration activities, as well as explore personal goals that may lead to a career in this field.

The Chugach School District continues to work with the Chugachmiut and Chugach Regional Resources Commission to coordinate and exchange community information with regard to regional restoration activities. As the coordinating agency for community involvement, Chugach Regional Resources Commission works with the youth through the local facilitators so that students may participate in research and restoration activities.

Since the inception of the project, significant contributions have been made and are identified in the budget. Contractors have provided discounted services, as in the case of vessel hiring. Expensive equipment used in project activities are offered by coordinating agencies. Cooperating agencies provide technical assistance, student supervision and support for project activities. The Chugach School District relies heavily on the commitment and participation of cooperating school districts involved in the project. Site teachers dedicate their time to the goals of Youth Area Watch, serving as an in-kind contribution.

In keeping with its commitment to secure additional support for Youth Area Watch activities, Chugach School District has sought and received two significant grants that

offset the cost of the project. A five-year ($498,750) U.S. Department of Labor grant allows the District to couple real life activities with education, focusing on how these experiences will be applied in adulthood; a particular objective of the grant is directed at science opportunities in response to Youth Area Watch. The second grant is a three-year ($510,000) 21-Century grant from the Department of Education that provides funds for real life after-school activities for students. In addition, the District will continue to commit general funds to the project and will seek out alternative funding sources as the program transitions away from Trustee Council support. The success of the project activities motivates the Chugach School District to commit additional funding through diversified means so that the youth are equipped to continue their restoration and ecological management activities as an integral component of their education.

As Trustee Council responsibility for restoration activities decreases due to the decline of settlement funds, the project coordinators continue to pursue opportunities where Youth Area Watch project activities can transition. Toward this end, the school district maintains cooperative relationships with entities engaged in ecological management and restorative projects, independent of Trustee Council funding. Particularly with respect to local restoration projects where other agencies, organizations and private groups are involved, the Youth Area Watch project scope is expanding so that a smooth shift of focus can occur. By building and maintaining these cooperative working relationships, resource exchanges can be enhanced to augment other district resources.

SCHEDULE

A. Measurable Project Tasks for FY 01 (October 1, 2000 - September 30, 2001)

July 1 - August 1, 2000:	Confirm research & data collection activities
August 15 - 31, 2000:	Site teacher orientation
September 1 - 18, 2000:	School site orientations
September 15 - 30, 2000:	Students selected for participation
October 1 - 31, 2000:	Site teacher training on protocol
October 1 - 31, 2000:	Student orientation and training
November 1 - 7, 2000:	Sites prepare weather stations
November 1 - July 30, 2001:	Students participate in research activities
November 1 - May 31, 2001:	Students maintain web site
March 1, 2001:	Project Coordinator sends data to PIs
May 1 - 15, 2001:	Site teacher follow-up training
June 1, 2001:	Project Coordinator sends data to PIs
June 1, 2001:	Students complete project reports for FY 01

Ongoing Activities:

February 01 - August 01:	Student bi-monthly collection of mussels
October 00 - September 01:	Student mussel bed monitoring

October 00 - September 01:	Student weather station monitoring (daily)
October 00 - September 01:	Students collect harbor seal samples with local hunters
October 00 - September 01:	Students conduct local project activities
October 00 - September 01:	Students assist in documenting local TEK
October 00 - September 01:	PIs interact and exchange information with students

B. Project Milestones and Endpoints

October 17, 2000:	Students selected for participation
October 30, 2000:	Protocol training complete
November 1, 2000:	Students conduct project activities
March 1, 2001:	Data/samples to PIs
June 1, 2001:	Data/samples to PIs and reports complete
October 17, 2001:	Students selected for participation
October 30, 2001:	Protocol training complete
November 1, 2001:	Students conduct project activities
March 1, 2002:	Data/samples to PIs
June 1, 2002:	Data/samples to PIs and reports complete
October 17, 2002:	Students selected for participation
October 30, 2002:	Protocol training complete
November 1, 2002:	Students conduct project activities
March 1, 2003:	Data/samples to PIs
June 1, 2003:	Data/samples to PIs and reports complete

C. Completion Date

Objectives identified in the project design will continue to serve as guidelines for community involvement within the civil settlement throughout the life of the restoration effort. It is expected that the Youth Area Watch project will be completed upon termination of the restoration process.

PUBLICATIONS AND REPORTS

Youth Area Watch was featured in "The Science Teacher," "Living on Earth" and "Alaska Magazine." Copies of these articles have been forwarded to the Restoration Office. In addition, the project has been featured on NPR. The project will also be featured during state-wide broadcasts on the Alaska Rural Communication System during programs on standards in education.

The Youth Area Watch Web site www.micronet.net/users/~yaw continues to be an important venue for students to both receive and distribute information. Each project that students work with has a student generated page of explanation and photographs. There is also space for students reports on their own local restoration projects as well as meteorological and oceanographic data. The site is utilized by students during the beginning of the year training as they attempt to learn about each of the projects that they will work with over the course of the year. FY '01 will be the first year that all of the community schools involved in the project are online. This will provide an opportunity for the project coordinator to communicate directly and regularly with students at each school. This increase in communication and coordination will provide for more flexible and responsive action by project coordinators and school site participants.

PROFESSIONAL CONFERENCES

Throughout the year, Chugach School District administrative staff showcase Youth Area Watch. This year, the project will be highlighted at a project based learning conference hosted by the Autodeck Foundation. The program was also presented at a meeting of 30 school districts in Ohio. Project coordinators will be running workshops on Youth Area Watch and how other schools could run similar programs at the Alaska Staff Development Network Rural Academy for Culturally Responsive Schools at the end of May in Fairbanks. The principal investigator will continue this programmatic modeling in FY '01 as opportunities become available.

NORMAL AGENCY MANAGEMENT

This section is not applicable.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Youth Area Watch relies on the participation of Trustee Council funded projects to maintain coordination with restoration efforts. Through the commitment of principal investigators, youth conduct research activities with and for participating projects. Students work independently, as well as beside researchers during the project year. Costs are shared between projects to allow for increased research vessel time and one-on-one interaction between students and the researchers.

Various people contribute the necessary technical assistance and resources. Local community facilitators from Community Involvement (/052) work with students and serve as chaperones for project activities. School districts provide teacher time and facility space for activities.

A variety of funding sources and project contributions ensure the success of the project. The school district commits over $164,385 in FY '01 to the project. School districts

contribute $54,700 in teacher time and $24,050 in facility resources. Communities and school districts contribute $12,600 in lodging. Equipment in-kind contributions total $7,200. Participating principal investigators from research projects contribute $9,140 worth of their time.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

This list of core projects is based on information in the FY '01 draft work plan. It should be noted that the project coordinator had planned to have students working with project 01477: Where Do Prince William Sound Harlequin Ducks Breed? A Satellite Telemetry Approach. The harlequin duck satellite transmitter project that was not recommended for funding. This leaves an opening for an additional project that requires student work in the spring. This opportunity for involvement in a new project will not be overlooked. The project coordinator is pursuing several opportunities to fill this opening. In the past, students have been involved on a minimal level with project 01462, "Effects of Disease on Pacific Herring Population Recovery in Prince William Sound." Dr. Marty has expressed an interest in expanding that involvement but we have been unable to fit it into the schedule in previous years. Students from Seward worked with George Divoky last year on project 01327 Pigeon Guillemot Restoration Research at the Alaska SeaLife Center. This project and principal investigator seemed like a good match for Youth Area Watch as well. Both of these projects seem likely to receive final year funding in FY '01. As is mentioned previously in this proposal, the Youth Area Watch project will be transitioning over the next two years to a larger percentage of non-Trustee Council funded projects. It will be necessary for Youth Area Watch to make this transition in order for the project to remain viable and effective beyond FY '02. The project coordinator is currently exploring these options with the ultimate goal of bringing in new and long term projects to fill this slot in the yearly schedule.

PROPOSED PRINCIPAL INVESTIGATOR

Richard DeLorenzo
Chugach School District
9312 Vanguard Drive, Suite 100
Anchorage, AK 99507
Office: (907) 522-7400
Fax: (907) 522-3399

PRINCIPAL INVESTIGATOR

Richard DeLorenzo is the superintendent of the Chugach School District. He maintains administrative authority over all day-to-day functions of the district's activities. Mr. DeLorenzo has extensive experience administering grants, adhering to project objectives

and managing budgets. Mr. DeLorenzo will be directly responsible for budget expenditures, negotiating contracts and working with the participating school districts to ensure effective project management.

OTHER KEY PERSONNEL

Project Coordinators: Jennifer Childress and Joshua Hall. Both Ms. Childress and Mr. Hall are certified secondary teachers with Bachelor of Science degrees in physical science.

As noted previously, the project coordinator position has been split into two, part-time positions to most effectively meet the objectives of the project. Jennifer Childress and Joshua Hall will share the following responsibilities:

1. working with principal investigators of research projects to ensure proper protocol.
2. coordinating student selection process.
3. coordinating all orientation and training sessions with site teachers and staff.
4. ensuring that site teachers and students have proper supplies.
5. completing site visits.
6. monitoring project activity of students.
7. providing support to site teachers.
8. coordinating principal investigator-student interaction through research.
9. transmitting data to principal investigators.
10. completing necessary project reports and/or materials for publication.
11. continuing to seek additional funding sources for project activities beyond the life of the Trustee Council.

LITERATURE CITED

Allen, W.H. "Biocultural Restoration of a Tropical Forest." Bioscience. 38(3): 156-161, 1988.

Block, Mindy. "Pine Barrens - Upland Associations." Notes, 1997.

Pinkerton, E. Cooperative Management of Local Fisheries: New Directions for Improved Management and Community Development. Vancouver: University of British Columbia Press, 1989.

Rogers-Martinez. "The Sinky One Intertribal Park Project." Restoration & Management Notes, 1992.

Approved 8-3-00

FY 01 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET
October 1, 2000 September 30, 2001

Budget Category:	Authorized FFY 2000	Proposed FFY 2001
Personnel		$0.0
Travel		$0.0
Contractual		$100.0
Commodities		$0.0
Equipment		$0.0
Subtotal		$100.0
General Administration		$7.0
Project Total		$100.7
Full-time Equivalents (FTE)		
Other Resources		

LONG RANGE FUNDING REQUIREMENTS

Estimated FFY 2002
$96.3

Dollar amounts are shown in thousands of dollars.

Comments:

2001

Project Number: 01210
Project Title: Youth Area Watch
Agency: ADF&G

FORM 3A
SUMMARY

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001	LONG RANGE FUNDING REQUIREMENTS					
Personnel	$56.4	$52.0						
Travel	$30.0	$25.0						
Contractual	$5.0	$5.0						
Commodities	$4.0	$3.0						
Equipment	$0.0	$0.0						
Subtotal	$95.4	$85.0				Estimated FY 2002	Estimated FY 2003	
Indirect	$18.6	$15.0						
Project Total	$114.0	$100.0				$90.0	$80.0	
Full-time Equivalents (FTE)	1.0	1.0						
	Dollar amounts are shown in thousands of dollars.							
Other Resources	$264.3	$277.5				$291.3	$305.1	

Comments:

Personnel - The two, part-time project coordinators share the duties of monitoring and facilitating the project activities at all sites.

Travel - Students travel by both charter (especially when conducting field work, such as mussel collection with the scientist). Student travel to Anchorage for the Science Review is a project contribution. Only transport expenses are requested through the budget. All per diem expenses are contributed to the project.

Contractual - The hiring of boats at a rate of $1,000 per day (5 days) will occur in conjunction with research on surf scoters and kittiwakes.

Commodities - Each major classroom site is allocated $333 for project supplies. Supplies from previous years will be used as well.

Indirect - School district administrative costs are calculated at 20%. This accounts for the direct oversight of fiscal reporting and associated support at the administrative offices in Anchorage. In addition, these costs offset the expenses that sites incure including telephone, fax, postage and other general support.

Other resources - Teacher time ($59,700); participating PIs ($9,140); Youth Area Watch PI ($13,025); Facility space ($24,050); equipment ($7,200); travel, facilities, lodging and additional adminstrative support ($164,385).

FY01

Project Number: 01210
Project Title: Youth Area Watch
Name: Chugach School District

FORM 4A
Non-Trustee
SUMMARY

Prepared:

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:			Months	Monthly		Proposed
	Name	Position Description	Budgeted	Costs	Overtime	FY 2001
	Project Coordinator	The coordinator facilitates training for both site teachers and participating students; coordinates youth interaction with research PIs; schedules project travel; works with local sites to develop community restoration projects; works with local facilitators and site teachers to ensure the exchange of information; monitors the completion of project activities; solicits additional funding for project enhancement.	12.0	4.33		52.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	12.0	4.3	0.0	
					Personnel Total	$52.0

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FY 2001
	Charter and /or commerical trips for students to training/research.	0.5	37			18.5
	Project coordinator from Anchorage to Cordova.	0.3	2			0.6
	Project coordinator from Anchorage to Nanwalek.	0.2	2			0.4
	Project coordinator from Anchorage to Port Graham.	0.2	2			0.4
	Project coordinator from Anchorage to Seldovia.	0.2	2			0.4
	Project coordinator from Anchorage to Seward.	0.1	3			0.3
	Project coordinator from Anchorage to Tatitlek.	1.0	2			2.0
	Project coordinator from Anchorage to Valdez.	0.2	2			0.4
	Research PI travel to training sites.	0.5	4			2.0
						0.0
						0.0
						0.0
					Travel Total	$25.0

FY01

Project Number: 01210
Project Title: Youth Area Watch
Name: Chugach School District

FORM 4B
Personnel
& Travel
DETAIL

Prepared:

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Contractual Costs:	Proposed
Description	FY 2001
The hiring of boats at a rate of $1,000 per day (5 days) will occur in conjunction with research on surf scoters and kittiwakes.	5.0
Contractual Total	$5.0

Commodities Costs:	Proposed
Description	FY 2001
Supplies for each classroom site are necessary. This will replace consumable commodities used during the project year. Commodities include chemicals, sampling containers (beakers, plastic bags), water resistent note pads and office supplies associated with the project. Each major classroom site (9) will require $333 for supplies, totaling $3,000.	3.0
Commodities Total	$3.0

FY01

Project Number: 01210
Project Title: Youth Area Watch
Name: Chugach School District

FORM 4B
Contractual & Commodities DETAIL

Prepared

2001 EXXON VALDEZ TRUS1 :OUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2001
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage: Description	Number of Units
Weather stations have been purchased in previous years. They will continue to be used in FY 01.	5
Computers and peripherals are used at each site to synthesize and post information on the Youth Area Watch web site.	8
Video equipment is used to document activities for future review and use.	1
A GPS unit is used during various project activities.	1

FY01

Project Number: 01210
Project Title: Youth Area Watch
Name: Chugach School District

FORM 4B
Equipment
DETAIL

Prepared:

01245

Revision 7-7-00
Approved TC 8-3-00

COMMUNITY-BASED HARBOR SEAL MANAGEMENT AND BIOLOGICAL SAMPLING

Project Number:	01245
Restoration Category:	General Restoration
Proposer:	Alaska Native Harbor Seal Commission
Lead Trustee Agency:	Alaska Department of Fish and Game
Cooperating Agencies:	
Alaska SeaLife Center:	No
Duration:	3rd year; four-year project
Cost FY 96:	
Cost FY 97:	
Cost FY 98:	
Cost FY 99:	$70,700
Cost FY 00:	$56,500
Cost FY 01:	$40,000
Cost FY 02:	$25,000
Geographic Area:	Prince William Sound, Cook Inlet, Kodiak, Alaska Peninsula
Injured Resource/Service:	Harbor seals; subsistence

ABSTRACT

This project continues, at a reduced level, work supported through previous harbor seal restoration projects (\244, 99245, and 00245). A biological sample collection program, implemented in FY96 and expanded in FY97, in Prince William Sound, lower Cook Inlet, Kodiak Island, and the Alaska Peninsula will continue. Village-based technicians are selected by the Alaska Native Harbor Seal Commission (ANHSC) and trained by the Alaska Department of Fish and Game to collect samples from subsistence harvested harbor seals. The samples are transported to Anchorage or Kodiak for further subsampling and distribution to participating scientists for analysis and the University of Alaska Museum for archival. The ANHSC will produce and distribute a newsletter with summaries of the biological sampling program.

INTRODUCTION

The goal of this project (which continues the work of #\244) is to support collaboration between subsistence hunters of harbor seals, scientists, and resource management agencies to assess the factors which are affecting the recovery of the harbor seal population of the oil spill area and to identify ways to reduce these impacts. In FY 94 (Project 94244) and FY 95 (95244), the Trustee Council provided funding for the Alaska Department of Fish and Game, Division of Subsistence, to compile available data, collect additional information, and to organize workshops and community meetings with scientists and subsistence users. Participants in the workshops concluded that the lack of a formal organization which represents subsistence users of harbor seals is a major impediment to communication between scientists and hunters and to the inclusion of subsistence hunters as full partners in harbor seal research and restoration. To fill this gap, Alaska Native participants in the harbor seal restoration workshop of March 2, 1995 voted to form an Alaska Native Harbor Seal Commission. In FY 96, Project 96244 assisted the ANHSC by providing it with funds to organize two workshops held in conjunction with commission meetings and to produce and distribute two newsletters and other communications. Additional workshops took place under Project 97244, Project 98244, and Project 99245.

A second consensus point reached at the workshops was that subsistence hunters are in an excellent position to assist in scientific studies through providing biological samples from subsistence-taken animals. A goal of Project 96244 was to test the practicality and effectiveness of a community-based harbor seal biological sampling program, designed and administered cooperatively between the Alaska Native Harbor Seal Commission, the Alaska Department of Fish and Game, and the University of Alaska. In FY 97, this program was expanded to collect samples from the Kodiak Island area and add Valdez to the sample communities in Prince William Sound. This program continued in FY 98, FY 99, and FY 00, with a planned expansion of the program to the Alaska Peninsula (two Perryville hunters were trained in October 1999) and to one more village on Kodiak (one Ouzinkie hunter was trained in February 2000).

As of mid April 2000, samples from 249 animals had been collected for researchers. Table 1 shows the number and sex of harbor seals biosampled in each fiscal year. Table 2 shows the number of tissue types distributed in each fiscal year. The total number of a specific tissue sample or part collected may not equal the total of animals biosampled. In certain circumstances, one or more types of samples may not be collected from the animal. Table 3 reports how the samples have been distributed. Table 4 shows the community origin of the samples from the oil spill region, as of September 1999. From October 1999 to mid April 2000, samples were collected in Chenega Bay, Cordova, Tatitlek, Valdez, Nanwalek, Port Graham, Akhiok, Old Harbor, Ouzinkie, and Perryville.

Finally, this project supports other restoration projects conducted in FY 00 and proposed for FY 01 and beyond, such as Harbor Seals: Monitoring and Field Research (\064), Harbor Seals: Health and Diet (\341), Harbor Seal Metabolism/Stable Isotopes (\371), Harbor Seal Diet: Lipid Metabolism and Health (\441),the Community Involvement and Traditional Knowledge Project (\052), and the Youth Area Watch (\210). The project also contributes to the Trustee Council's recovery objectives for subsistence by facilitating involvement of subsistence users in the restoration process.

The ANHSC and the National Marine Fisheries Service have signed a Co-Management Agreement for harbor seals. As established in the agreement's Action Plan, biosampling is a high priority research area.

Table 1. Summary of the number of harbor seals biosampled by fisal year

		NUMBER of HARBOR SEALS BIOSAMPLED			
		Total	Male	Female	Unkown Sex
FY96	Oct 95 - Sept 96	27	18	8	1
FY97	Oct 96 - Sept 97	54	23	24	7
FY98	Oct 97 - Sept 98	40	18	21	1
FY99	Oct 98 - Sept 99	61	37	22	2
FY00*	Oct 99 - mid April 00*	67*			

*NOTE: The total for FY00 is estimated to reach between 80-90 by the end of Sept 00.

Table 2. Summary of the number of each tissue type collected.

	NUMBER COLLECTED IN			
TISSUE TYPE	FY96	FY97	FY98	FY99
Head	27	53	20	60
Whiskers	27	53	40	57
Stomach	26	54	35	59
Blubber	26	45	34	50
Skin / Muscle	27	54	40	60
Heart / Liver / Kidney	27	46	36	52
Female Reproductive Tract	1	17	8	17

Table 3. Distribution of Subsistence Harbor Seal Samples Collected under EVOS Restoration Projects 244 and 245 (as of 9/30/99)

Tissue	# Samples	Contact	Disposition, status, and analysis
Stomachs	174	L. Jemison, ADF&G	Sent to UBC for prey identification
Teeth	160	R. Small, ADF&G	Extracted at UAF Museum; age & growth history to be determined by NMFS
Whiskers	177	D. Schell, UAF	Used in stable isotopes analyses (EVOS # 97170)
Brain and collagen[1]	157	A. Hirons, UAF	Used in stable isotopes analyses (EVOS # 97170)
Blubber	155	B. Fadely, et al., UAF & M. Castellini, UAF	Blubber composition studies completed and continuing (EVOS Proj. 95117)
		K. Frost, ADF&G	Sent to Dalhousie University for fatty acid analysis (EVOS Proj. 95064)
Skin/muscle	181	R. Westlake, NMFS	Sent to NMFS La Jolla for genetic analysis
Reproductive tracts	43	K. Pitcher, ADF&G & H. Harmon, UAF	Stored for future reproductive analysis
Skulls	160	G. Jarrell, UAF	UAF Museum staff is cleaning skulls for archive and morphometric examination
Archived tissue heart liver kidney blubber skeletal muscle	161	A. Runck, UAF	Tissues subsampled and archived in -70C freezer at UAF Museum; available for future analyses.

[1] Collagen from ligaments or tendons; also using muscle, blubber, skin, heart, liver, and kidney

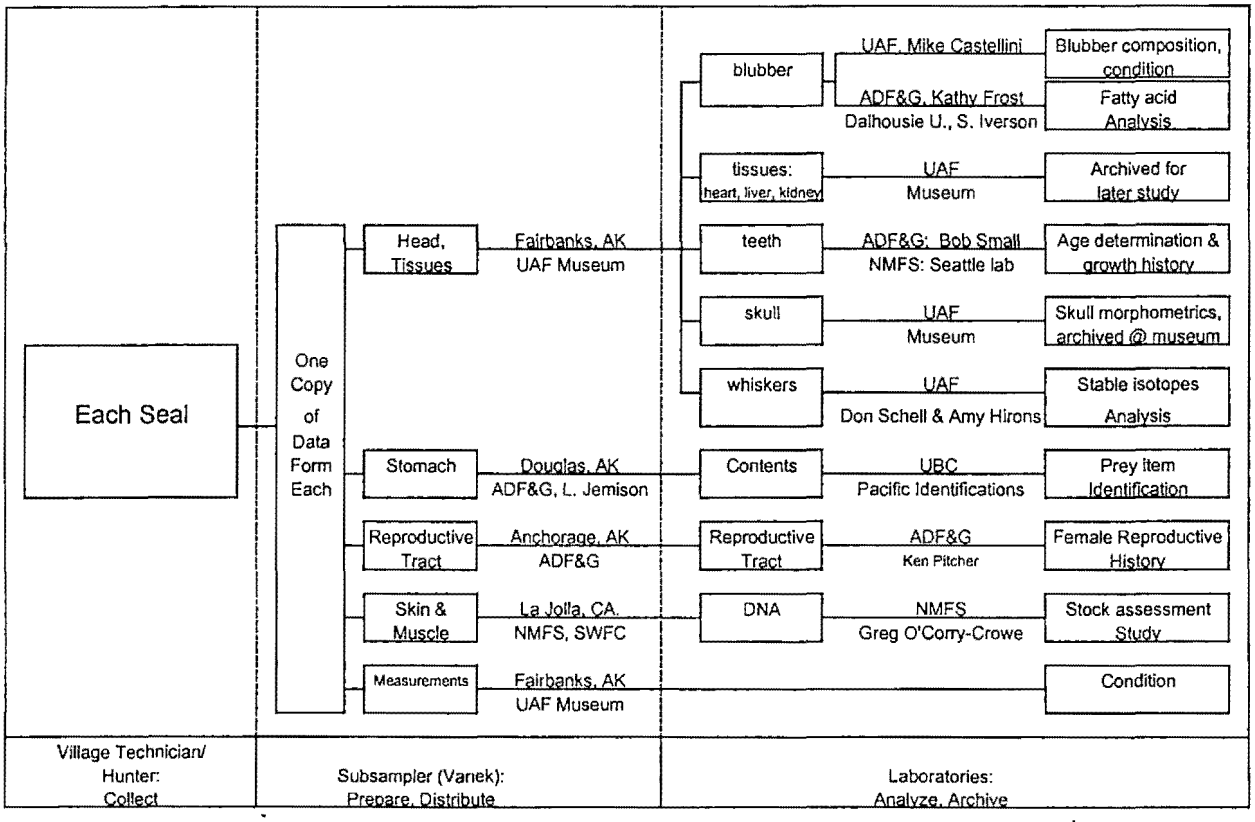

Figure 1. Sample Distribution and Chain of Responsibility (As of 9/99)

Table 4. Summary of Harbor Seal Biosamples Collected (9/30/99)*

Community	Number of Seals Sampled	
	Full Set of Samples	Partial Set of Samples
Chenega Bay	4	3
Nuciiq	2	0
Cordova	30	4
Tatitlek	64	37
Valdez	15	0
Nanwalek	6	1
Port Graham	0	0
Seldovia	2	3
Afognak Island	1	1
Akhiok	5	0
Old Harbor	1	1
Port Lions	1	1
GRAND TOTAL	131	51

FULL SET= Head, whiskers, stomach, muscle, skin, blubber, liver, heart, kidney, female repro tract
PARTIAL SET = A portion of the above list.
*NOTE: From Oct 99 - mid April 00, 67 animals were sampled in Chenega Bay, Cordova, Tatitlek, Valdez, Nanwalek, Port Graham, Akhiok, Old Harbor, Ouzinkie, and Perryville

NEED FOR THE PROJECT

A. Statement of Problem

The harbor seal populations of Prince William Sound and the northern Gulf of Alaska were in decline before the oil spill for unknown reasons. The spill injured these populations, adding to the decline, and they are not recovering. Harbor seals are a primary subsistence resource in the Alaska Native communities of the oil spill region. Subsistence harvests of harbor seals have declined in many of communities since the spill because of the reduced population size and voluntary efforts on the part of hunters to limit their harvests to aid in recovery. In order to assess these efforts and to identify measures which subsistence users could take to further assist in harbor seal restoration, the Trustee Council funded projects in FY 94 and FY 95 to compile existing data, collect additional information, organize meetings of scientists and subsistence users, and develop recommendations for hunters. Two workshops took place. Among other things, participants at the workshops recognized that without a formal organization representing subsistence hunters of harbor seals, it was unlikely that a consensus on recommendations could be developed or that a dialogue between hunters and scientists could be maintained. Workshop participants stressed that strong involvement of hunters in research activities and management decisions was an essential ingredient in any plan for harbor seal recovery. Several other restoration projects are examining the potential causes of the harbor seal population decline and lack of recovery, including mortality caused by humans. The need exists to continue to follow through on the workshop recommendations to support these harbor seal restoration efforts.

B. Rationale/Link to Restoration

The recovery objective for harbor seals states that recovery will have occurred when harbor seal population trends are stable or increasing. Based on findings from two workshops which involved scientists and subsistence users of harbor seals (conducted under Projects 94244 and 95244), meeting this recovery objective is enhanced by continuing dialogue between scientists and subsistence users, involving subsistence hunters in research efforts, involving traditional knowledge in scientific studies, and collaborating in the development of recommendations for subsistence hunters about how they can assist in harbor seal recovery. This project implements the recommendations of the workshops by continuing a biological sampling program and helping to support the activities of the Alaska Native Harbor Seal Commission.

The FY 96, FY 97, FY 98, FY 99, and FY 00 Restoration Work Plans included research projects to monitor seal population trends and conduct research to discover why harbor seals are not recovering. These are likely to continue in FY 01. Assessing parameters that affect marine mammal abundance and health requires access to and examination of animals or tissues. Marine mammals are inherently difficult to study and the collection and examination of tissues is further complicated by legal limitations imposed by federal protective measures and permitting procedures. Sacrificing animals for research purposes is either undesirable or illegal, and beachcast carcasses are often too decomposed to be of value. A invaluable source of fresh specimens exists in Alaska, where coastal Alaska Natives still legally use marine mammals for subsistence or handicraft purposes. This project has developed a successful community-based bio-sampling program. This program has succeeded because:

1. Local people support the program and its goals, are involved in the sample collection, understand the significance of the data being collected, are willing to store and ship samples from villages to a central receiver, and are trained and willing to record data and collect samples as instructed.

2. Samples are easily collected, stored and shipped; they are subsequently sub-sampled by ADF&G staff; are analyzed in due time; and results are returned to villages.

Furthermore, over the last several years, the Trustee Council has attempted to involve spill-area communities more fully in the restoration process. The biosampling effort is a prime example of this involvement and collaboration.

C. Location

The biological sampling portion of the project includes the Prince William Sound communities of Cordova, Chenega Bay, Valdez, and Tatitlek; the lower Cook Inlet communities of Seldovia, Port Graham, and Nanwalek; the Kodiak Island communities of Akhiok, Old Harbor, Ouzinkie, and Port Lions (expansion to Ouzinkie in FY00); and the Alaska Peninsula communities of Chignik Lake and Perryville (planned expansion in FY 00) (Table 4).

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

Community and subsistence user involvement in the restoration process and in harbor seal recovery is a central purpose of this project. The primary continuing goal is to support the involvement of the Alaska Native Harbor Seal Commission in the biosampling program. As part of the continuing biological sampling effort, the ANHSC selects technicians (most of whom will be subsistence harbor seal hunters) in participating communities. New technicians will be trained by ADF&G staff to collect biological samples. Subsistence hunters will supply the samples and will be trained through hands-on instruction and the use of an instructional video (produced in FY 96), as needed. Also, participants in the Youth Area Watch Project in Prince William Sound and lower Cook Inlet(\210) and the more recently formed Kodiak Island Youth Area Watch(\052A) will be included in project activities, including community technician training sessions. The ANHSC will produce a newsletter with summaries of the biosampling efforts. (The October 1999 newsletter was distributed to over 1,000 individuals and organizations.) Although project funds are no longer available to help support a workshop, it is anticipated that the biosampling program and results will be reviewed at ANHSC meetings.

As of April 2000, five training sessions funded through this project in FY00 had taken place in Kodiak, Port Graham, Cordova, and Anchorage. About 20 new hunters and 46 students attended these sessions. Through other funding, training has also taken place in Dillingham and Manokotak in the Bristol Bay area and hunters from the Aleutians have been trained. A biosampling demonstration took place at the ANHSC meeting in Angoon in April 2000. Additional demonstrations are planned for Youth Spirit Camps in July 2000.

PROJECT DESIGN

A. Objectives

The primary premise upon which this project is based is that restoration of harbor seal populations is facilitated by involving subsistence users in research and management activities. Key to the success of this effort is support for the activities of the Alaska Native Harbor Seal Commission. Specific objectives include to:

1. Continue a community-based program to collect biological samples and other information from harbor seals in Prince William Sound and the northern Gulf of Alaska involving hunters from Cordova, Tatitlek, Chenega Bay, Valdez, Seldovia, Port Graham, Nanwalek, Akhiok, Old Harbor, Ouzinkie, Port Lions, Chignik Lake, and Perryville. Specific sub-objectives include:

    a. Train local technicians and hunters in biological sample collection procedures
    b. Maximize sampling for efficiency and coordination with other harbor seal projects
    c. Evaluate the program's effectiveness and develop a more long-term funding plan.

2. Collect biological samples and other information from harbor seals harvested by subsistence hunters in 13 communities: Tatitlek, Chenega Bay, Valdez, Cordova, Seldovia, Port Graham, Nanwalek, Akhiok, Old Harbor, Ouzinkie, Port Lions, Chignik Lake, and Perryville. Provide these samples to researchers for analysis and archival.

    a. Collect information about the number, sex, approximate age and place and date of harvest for harbor seals taken in each village

b. Collect biological samples to be analyzed in cooperation with other harbor seal projects, including blubber, whiskers, skin, heads, muscle, kidney, liver, heart, female reproductive tracts, and stomachs (see Table 3 and Figure 1).
c. Store samples in a community freezer and periodically ship samples to Anchorage or Kodiak for further processing and distribution for analysis
d. Develop and maintain a procedure for tracking disposition of samples and results of analyses
e. Maintain a database of biosamples

3. In collaboration with the Alaska Native Harbor Seal Commission, communicate information about research and results of harbor seal studies to hunters and scientists on a regular basis.

a. Produce an informational newsletter describing results of harbor seals studies, ongoing harbor seal research, and community involvement
b. Maintain a database of biosamples and research
c. Discuss biosampling program and results at periodic meetings of the ANHSC (these meeting are funded through other programs)

4. Collaboratively produce recommendations for subsistence users of harbor seals that derive from study findings and the discussions at community meetings and workshops

a. These recommendations will be based on traditional knowledge, contemporary observations, and scientific findings
b. Recommendations will be developed at meetings of the ANHSC.

5. Evaluate the program's effectiveness and explore options for a long-term funding plan for the biological sampling program

6. Coordinate with the Youth Area Watch Programs in Prince William Sound and lower Cook Inlet (/210) and on Kodiak Island (/052A) to involve participants in that program in biological sampling and workshops and to support a yearlong curriculum based on information gathered through the biosampling program.

B. Methods

Objectives 1, 2, & 6: Biological Sampling Program

For Objectives 1, 2, and 6, the Biological Sampling Program, the following procedures will be used:

1. *Trainings*

As part of Project 96244 (and revised as part of 97244 and 98244), a marine mammal biologist, Kate Wynne of the University of Alaska, and Vicki Vanek, a veterinarian with the Division of Subsistence (ADF&G) compiled protocols, synthesized these into useable formats, developed data forms, labels, and sampling kits, and incorporated instructions for their use into a training program. In FY 99 under 99245, Vanek assumed full responsibility to apply these materials and revise them as appropriate.

Instruction. Sampling requires instruction or training of community-based sampling technicians, who ideally are also subsistence seal hunters. Any new village-based technicians will attend a full-day sampling training session in Kodiak or Anchorage. Vanek will provide a detailed explanation of project goals, and significance and use of data to be collected; distribute sampling kits; explain and demonstrate sampling techniques and use of equipment; and distribute written and graphic instructional materials to take to villages.

Other hunters will be informed of program objectives and specified sampling requirements through communication with village technicians and other project personnel and through written, graphic, and video instructional materials.

2. *Training Materials*
Manual: This was produced in FY 96 (Project 96244). It includes step-by-step diagrams and a visual guide. It is waterproof and is included in the sampling kit. Labor is involved in laying out, laminating, and binding each new manual for newly-trained local assistants.

Examples: If a seal is available, at the training session participants work on an actual animal, filling in data forms and labels. Otherwise, the training relies on slides, the training video, and artificial props.

Video. In FY 96 (Project 96244), a training video was produced by ADF&G, incorporating footage shot at the two training sessions. It has been distributed to the technicians trained at these sessions. The video includes project rationale and objectives; footage of current research and population declines; significance and use of data to be collected; demonstrations of how to fill in data forms and labels; demonstrations how to use sampling kit and supplies; demonstrations of where and how to remove tissues from animals; and demonstrations of how to sub-sample, bag, and label tissues.

Resource Notebook. In FY00, a resource notebook was developed to provide additional information for hunters, technicains, and students to use as reference material at home and during the trainings.

3. *Sample collection*
Technicians. There is a village-based technician in each participating community, whose responsibilities are to take samples from seals taken by themselves or participating hunters, record data as requested, assure access to freezer and sampling supplies, notify Vanek or Riedel when supplies are low or freezer is nearly full, and load and ship coolers with samples to Anchorage, Cordova, or Kodiak.

Key hunters. Ideally at least two hunters per village provide subsistence taken seals from which the technicians take samples, and record data as requested.

Sample size and distribution. It is difficult to predict the number of samples that may be collected in this program annually or by community, but we have assumed a total of 70 animals for estimating project costs. Other funding is secured for up to an additional 20.

Tissues to be collected. A minimal sample can be collected by technicians in each village with relative ease and subsequently sub-sampled in Anchorage or Kodiak to provide the suite of tissue

samples required. We have trained technicians and hunters to record information about harvest location and date, animals' sex, evidence of tags or markers, and standard measures of weight, length, girth, and blubber thickness. Technicians are trained to collect the whole head; vibrissae; stomach (after tying off both ends); female reproductive tract; and samples of liver, heart, kidney, blubber, muscle, and skin. Although collecting the reproductive tracts and claws is highly desirable, it is realistic to assume they will be collected opportunistically only from those hunters willing to dedicate extra effort required to collect them.

Researchers utilizing samples in their work were contacted late June 2000 and asked to submit information to the EVOS Trustee Council Office outlining the type and number of tissues they would like collected to be used in their work in FY01 or to be archived for possible future use. Table 5 is a summary of the information supplied.

Table 5. Summary of requests and information from researchers on sample collection in FY01

Researcher	Agency	Tissue Type	Number	Notes
Derek Campbell Greg O'Corry-Crowe	NMFS Southwest Fisheries Center	skin & muscle	75-100	
Mike Castellini	U of Alaska-Fairbanks	blubber	nns*	
Don Schell	U of Alaska-Fairbanks	muscle	nns*	
Kathy Frost Sara Iverson	ADF&G Dalhousie U	blubber	nns*	
Jennifer Burns	U of Alaska-Anchorage	specific skeletal muscles	18	specific age class
Joe Cook Gordan Jarrell	U of Alaska Museum	heads whiskers heart liver kidney	150 from south central & western Alaska	tissues used by researchers world-wide (see letter for list)
Bob Small Lauri Jemison Kelley Hastings	ADF&G	stomachs teeth repro tracts liver kidney blubber	?as many as possible " " ?5 - 10 ?5 - 10 ?5 - 10	exact info delayed - numbers based on recent past communication

*nns = no number specified In past, these researchers have utilized as many as collected

Sampling procedure.

Step 1. In the community: village technician receives sample from the hunter, or works with an animal they have taken themselves. The data form is filled out at the time samples are taken by technician-hunters in the field, or by non-hunting technicians in the community, or by youth from the Youth Area Watch projects. The dataform and samples from one animal are placed in one animal specimen bag for village-based storage. Technicians have a kit that includes supplies

adequate for sampling of 8 animals. Among the items in each kit are 1) ziploc sampling bags for collection of the head, stomach, and tissues, 2) large garbage bags in which to place the sample bags collected from each animal, and 3) data forms and specimen labels. The head, stomach, and tissues will each be individually bagged in their own ziploc bag. Each is identified on the outside with a marker and has a specimen label enclosed with the same information that uniquely identifies the animal in the field (this system uses the technician's name, village, harvest date and sequential number of animal sampled and is also recorded on the dataform). All the individual sample bags from one animal are placed in one large garbage bag along with its data form. The specimen bag and the data form are placed in a freezer without sub-sampling, the technician contacts Vicki Vanek or Monica Riedel when a full shipment has accumulated, and then sends the samples to Kodiak or Anchorage.

Step 2. Vicki Vanek receives samples in Anchorage and stores them at ADF&G or receives them in Kodiak and stores them at the Fisheries Technology Center. Periodic sub-sampling efforts occur as depicted in Figure. 1. At this time, each animal is assigned a unique number tied to the University of Alaska Museum Archive numbering system, in order that all researchers may easily identify other tissue samples from this animal with other researchers or those archived at the musem. Each tissue sample is identified with this assigned number on the outside of the sample bag, on the label inside, and on the dataform. Subsamples from each seal are repackaged into individual bags and labeled. They are kept frozen and shipped to the appropriate laboratory (see Fig. 1).

4. *Data collection*

Data are recorded on write-in-the-rain forms designed for standardization of data with other harvest-sampling programs. Presently, copies of the original forms have been supplied along with the subsample to researchers on paper only. A future goal is the development of an electronic version of this form, as recommended during the EVOS scientific review committee's review of project \244. All of the data recorded on the forms in the field is entered and kept in in a EXCEL database along with other tracking information. Sample label and freezer log forms have been developed to assure adequate sample tracking. In the field, technicians uniquely identify each animal. At the time of processing, each animal receives a unique number that is tied to the UAF Museum Archive numbering system. The number is assigned before any subsampling occurs so all parts are linked to the appropriate animal and can be easily tracked.

5. *Sample analysis*

Figure 1 provides a summary of the research programs involved in the tissue analysis. It is expected that participating scientists will acknowledge in any reports and publications the role of the ANHSC in facilitating the biological sampling program. In Project 99245, an agreement form was developed which participating researchers will sign to agree to return the results of their analysis for inclusion in databases and to acknowledge the assistance of the ANHSC.

6. *Data management and reporting*

Biological data collected from this program have been managed and maintained in a data base using Microsoft Excel software that is easily translated or integrated with software used by other agencies and organizations. This database has been centrally maintained by ADF&G and a summary of the samples collected and analyzed were included in the project's annual and final reports to the Trustee Council, with copies to pertinent agencies, such as NMFS. Additionally,

ADF&G (Vanek) will collate the results of the sample analysis into a readily understandable newsletter, that will be provided to all the project participants.

In Project 99245 and continuing in Project 00245, steps are being taken to enhance this database, as recommended by the EVOS scientific review committee. These include:

a. Enhance UAF Museum database for back-up tracking, to include information on the biosampled seals, such as the names of researchers who received samples and identification of the sample with this program (see below).
b. Development of an electronic data form (see above). This will facilitate communication of information and incorporation of sample data into databases
c. Development of a form that summarizes research investigators, contact numbers, projects, and publications for samples from a particular animal
d. Development of a biannual biosample status report. Presently there is no automatic system in place for researchers to return the results of their analyses or to update other participants on their activities and progress. This will be an electronic form to be submitted every six months by each researcher who receives biosamples from this project.

UAF Museum Database update.
The following information was supplied by Gordan Jarrell, the Mammal Collection Manager of the Univerisity of Alaska Museum.

An effort to develop database structures at the University of Alaska Museum (UAM) that will relate projects that provide specimens, such as the Alaska Native Harbor Seal Commission's Biosampling Program, to projects that use specimens has been substantially upgraded prior to implementation. UAM has developed a shared data model with the Museum of Vertebrate Zoology at the University of California at Berkeley. Their model, now including the "projects layer," has been implemented in Oracle on a new Sun server at UAM. (Berkeley's website incorporating this new model is up and running at htpp://elib.cs.berkeley.edu/mvz/) We are in the process of moving Mammal Collection data into the new structure and we expect to complete the task this fall or early winter. This data model was central to a successful proposal to the National Science Foundation to form an "Arctic Archival Observatory" (AAO) at UAM. Funding from NSF includes support for a full-time programmer/analyst to bring all the Museum's scientific collections into the system over next three years. This recruitment was successful and will be filled beginning on 5 September.

The Museum's database upgrading began in October 1998. This evolved into changing to a new cutting edge data management system developed and coordinated with the University of California at Berkeley's museum database. Various unforeseen steps in the building of a new information structure and developing the various layers concept have delayed the actual startup. The museum is in the final stage of getting all screens and interfaces working. They are starting the data import from the current system. The Harbor seal projects are the first sets of data to be transferred over into this new system. This new system is expected to be running and allowing access from the Web by December 2000.

7. *Youth Area Watch programs*

Participants will attend biosampling trainings and be trained as technicians. Support will be given to the Youth Area Watch programs in developing a curriculum that incorporates biosample collection and study results. This will initially include developing a limited set of classroom lessons that illustrate the application of length, weight, sex, location, timing, and stomach content data.

Summary: Proposed responsibilities of each cooperating group for Objectives 1 and 2:

Vicki Vanek of the Alaska Department of Fish and Game, Division of Subsistence will:

1. Compile protocols, develop data forms and sampling kits, and incorporate instructions for their use into a training program (this was completed in Project 96244; appropriate revisions will take place in Project 00245); make appropriate revisions to the instruction manual.
2. Communicate with researchers
3. Help answer biosamplers' questions
4. Train new community assistants when replacements are necessary;
5. Receive samples from village-based technicians, process samples, and ship samples to participating researchers for analysis
6. Maintain the in-house database of biological data and work with the UAF Museum in development of a database there
7. Collate the results of the sample analysis into a readily understandable newsletter.
8. Write a brief summary of the project for inclusion in the interim and final reports for the Trustee Council
9. Provide technical support for Youth Area Watch school curriculums
10. Develop and maintain electronic exchange of information with researchers, including providing data forms to researchers and researchers' subsample status and results (from biannual reports) for annual reports and reports prepared by the ANHSC.

The Alaska Native Harbor Seal Commission will:

1. Identify and subcontract with 13 community technicians
2. Purchase sampling kits and distribute kits and other supplies to village-based technicians
3. Facilitate production of manual and resource notebook
4. Set up air freight accounts for shipping samples and facilitate shipping from communities to Kodiak or Anchorage
5. Receive samples from Prince William Sound biosamplers, in Cordova and prepare for shipping to Anchorage for subsampling and distribution.
6. Communicate study findings through a newsletter and at its periodic meetings

Objectives 3, 4, and 5: Communications, Recommendations, and Evaluation

Communication of study findings, development of recommendations for hunters, project evaluation, and development of a long-term funding plan, are part of a collaborative effort met in part through a contract with the ANHSC, which will do the following:

1. Communicate with communities involved in the biological sampling project to review data and any recommendations developed by the ANHSC. These communications may be

through phone discussions or take place during community visits connected with biosampling training or other ANHSC business
2. Write a newsletter which provides overviews of findings from harbor seal research and ANHSC activities.
3. Participate in the Trustee Council restoration workshop and contribute to Trustee Council's annual and final reports

The Division of Subsistence will provide technical assistance to the Commission as needed. The goals of these objectives are also addressed through the development and maintenance of databases, as discussed above.

Annual and final reports: the Division of Subsistence and the ANHSC will jointly prepare annual and final reports for the project.

C. Cooperating Agencies, Contracts, and Other Agency Assistance

A. In prior study years, a contract was developed with the Alaska Native Harbor Seal Commission to undertake portions of the project. This contract will be amended to include the objectives for Project 01245. Tasks for the ANHSC under this contract will include:

1. Purchase sampling kits and distribute kits and other supplies to village-based technicians
2. Set up air freight accounts for shipping samples
3. Identify and subcontract with local community technicians
4. Prepare brief (letter format) quarterly reports on its activities as related to this project.
5. Attend the Trustee Council Restoration Workshop and contribute to Trustee Council's annual and final reports

Through subcontracts with the ANHSC, community technicians in 13 communities (Cordova, Tatitlek, Chenega Bay, Valdez, Seldovia, Port Graham, Nanwalek, Akhiok, Old Harbor, Ouzinkie, Port Lions, Chignik Lake and Perryville) will do the following:

1. Attend one day training session (if newly hired in FY 01)
2. Collect samples (stomach contents, female reproductive organs, liver, heart, kidney, claws, head)
3. Record data on harvest locations, sex, evidence of tags or markers, length, and girth
4. Label and freeze samples, notify Vicki Vanek or the ANHSC when freezers are full, and load and ship coolers with samples to Kodiak or Anchorage

Contract A: Budget

Personnel	Executive Director for 12.0 months @ 1/3 time	$0
	Program Assistant for 6.5 months @ ¼ time	3,250
Travel	Executive Director travel	1,000
Operational costs: phone & mailing		2,400
Insurance		1,200
Sampling and freezer supplies, shipping		800

Subcontract, village-based technicians	3,350
15% indirect program cost	1,800
Total	$13,800

Note: In kind contributions for the operations of the ANHSC include technical assistance from the Chugach Regional Resources Commission (Anchorage), the Alaska Sea Otter Commission (Fairbanks), and the Indigenous Peoples' Council on Marine Mammals (Anchorage).

Other funding from NMFS was secured for Monica Riedel's time in June 2000. Her availability may be slightly reduced at times due to new obligations. A part time program assistant to help with various biosampling tasks has been added. Monica Riedel's duties will remain the same.

Subcontract: Village-based Technicians

Training honorarium: $100/day for two new technicians for one day each:		200
Compensation for taking biological samples of seals		3,150
	Total	3,350

Note: it is anticipated that samples will be taken from a total of 70 seals and that it will take about 3 hours per seal to take samples, store samples, and ship samples. At a rate of $15/hour, this gives: $15 x 3 hours x 70 seals = $3,150.

SCHEDULE

A. Measurable Project Tasks for FY 01

Start-up to October 15, 2000:	Update contract with the Alaska Native Harbor Seal Commission; hire technicians
October to December 2000:	Hold training sessions for biological sampling for new community technicians and students
October to September 2001:	Biological sample collection
November to September 2001:	Process samples
March/April 2001:	Produce and distribute newsletter (Alaska Native Harbor Seal Commission)
April 15, 2001	Annual report
September 2001:	Evaluate fifth year of program

B. Project Milestones and Endpoints (includes \244)

1. Development of sampling program: October/November 1995
2. Production and distribution of Instructional video: March 1996
3. Workshops to train local hunters and technicians in collection procedures: October/November 1995
4. Workshop in conjunction with meeting of Alaska Native Harbor Seal Commission: March 1996
5. Produce and distribute first proceedings report: April 1996
6. Maximize coordination with other programs: ongoing
7. Ship samples to appropriate laboratories for subsequent analysis: ongoing
8. Advise villages and scientists of analytical results when available: ongoing
9. Conduct interviews with hunters to collect traditional knowledge: ongoing
10. Second workshop in conjunction with Commission meeting: September 1996
11. Produce and distribute second proceedings report: September 1996
12. Train new village technicians and new Youth Area Watch participants: November 1996
13. Hold workshop in conjunction with ANHSC meeting: March 1997
14. Demonstrate updated Traditional Knowledge Database: March 1997
15. Produce and distribute proceeding for 1997 workshop: April 1997
16. Annual report: April 15, 1997
17. Complete map database and report: June 1997
18. Present Biosampling Demonstrations at Youth Spirit Camps June/July 1997
19. Evaluate the program's effectiveness and develop a more long-term funding plan: September 1997 and September 1998
20. Train new Youth Area Watch participants: October 1997
21. Hold workshop in conjunction with ANHSC meeting: March 1998
22. Produce and distribute proceedings for 1998 workshop: April 1998
23. Develop electronic forms for researcher exchange of information and system to transmit forms, assist UAF Museum to add tracking information to computer programs as a backup to main database: ongoing
24. Assist in Youth Area Watch curriculum development: May 1998
25. Present Biosampling Demonstrations at Youth Spirit Camps July 1998
26. Final report, \244: September 30, 1998

27. Train new community technicians and new Youth Area Watch participants: October/November 1998
28. Hold workshop in conjunction with ANHSC meeting: March 1999
29. Produce and distribute proceedings for 1999 ANHSC meeting: April 1999
30. ANHSC sign Co-Management Agreement with NMFS April 1999
31. Biosampling Demonstration at multi-community Cultural Week May 1999
32. Present community reports May 1999
33. Facilitate sampling collection between hunters and scientists in field June 1999
34. Initiate contract for expanded biosampling program with UAF July 1999
35. Implement expanded biosampling program with UAF Aug 1999
36. Plan and facilitate training workshops Sept 1999
37. Develop Harbor Seal Biosampling Resource Notebook Sept – Oct 1999
38. Facilitate development of Kodiak Youth Area Watch Aug – Dec 1999
39. Produce and distribute newsletter Oct 1999
40. Conduct expanded training workshop for hunters Oct 1999
41. Train Youth Area Watch participants - PWS Nov 1999
42. Train Youth Area Watch participants and hunters - Lower Cook Inlet Dec 1999
43. Conduct audit for FY 98 and FY99 Jan 2000
44. Present poster and biosampling data at EVOS workshop Jan 2000
45. Present poster and biosampling data at Marine Mammal Stranding workshop Feb 2000
46. Train Youth Area Watch and hunters - Kodiak Feb 2000
47. Hold workshop in conjunction with ANHSC meeting April 2000
48. Present community reports May 2000
49. Facilitate sample collection with hunters and scientists in field June 2000
50. Maximize coordination with other programs and Native Organizations: ongoing
51. Collection of biosamples: ongoing
52. Process and ship samples to labs and UA museum for subsequent analysis and archival: ongoing
53. Advise Tribes, communities, and scientists of research results: ongoing
54. Produce and distribute proceedings from April 2000 meeting July 2000
55. Present Biosampling Demonstration to Youth Spirit camp participants July 2000
56. Annual Report 7/30/00
57. Produce and distribute newsletter Sept 2000
58. Facilitate planning for training workshop and Youth Area Watch programs Sept 2000
59. Training workshops for technicians and students Oct – Dec 2000
60. Hold training workshop in conjunction with ANHSC meeting Oct 2000
61. Participate in EVOS GEM workshop Oct 2000
62. Conduct audit for FY00 Nov 2000
63. Collect, process, and ship samples for analysis and archival: ongoing
64. Advise Tribes, communities, and scientists of research results when available: ongoing
65. Continue development of Resource Notebook and high school curriculum: ongoing
66. Hold training workshops Jan - March 2001
67. Hold workshop in conjunction with ANHSC spring meeting April 2001
68. Produce and distribute newsletter March –April 2001
69. Present community reports May 2001
70. Present Biosampling Demonstration to Youth spirit camp participants June –Aug 2001
71. Annual Report 4/15/01
72. Annual Report 4/15/02

C. Completion Date

This project should continue as long as the Marine Mammal Ecosystem Research package is underway. It is anticipated that work on several marine mammal restoration projects will continue into FY 01, including, \341 (Harbor Seals: Health and Diet), \371 (Harbor Seal Metabolism/Stable isotopes), and \441 (Harbor Seal Diet: Lipid Metabolism and Health). Harbor seal research projects in the spill area with other funding are also utilizing samples collected in the Biosampling Project.

PUBLICATIONS AND REPORTS

Annual report	July 30, 2000
Annual report	April 15, 2001
Annual report	April 15, 2002
Final report	September 30, 2002

PROFESSIONAL CONFERENCES

No attendance planned for FY 01.

NORMAL AGENCY MANAGEMENT

The Division of Subsistence of the Alaska Department of Fish and Game has no statutory or regulatory responsibilities for marine mammal management. Without this project, marine mammal biologists who are working on harbor seal recovery will lose a key source of biological information on this species. Trustee Council support of the activities of the Alaska Native Harbor Seal Commission has improved management of the injured harbor seal resource by facilitating communications between scientists and subsistence users and providing traditional knowledge to factor in to harbor seal studies. The ANHSC has received a congressional appropriation through the National Marine Fisheries Service to support certain administrative and operational costs, such as office space and travel to certain meetings and conferences. It is seeking funding from NMFS in accordance with provisions of the Marine Mammal Protection Act to support its long-term activities.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

The project provides biological samples from subsistence-taken harbor seals to address potential health and nutritional problems that may be impeding harbor seal recovery, including restoration project numbers \341, \371, and \441. The project provides information to researchers working on harbor seal restoration projects and facilitates their work with Alaska Native hunters..

Participants in the Youth Area Watch projects (\210and \052A) participate in community technician training sessions and attend workshops.

Several programs exist using sample tissues collected from harbor seals in the spill area (see Tables 3 and 5 and Fig. 1). As noted above, every effort is made to coordinate with these programs to minimize the burden and confusion of hunters and communities, maximize logistical efficiency, collect comparable or standardized data whenever possible, and limit the likelihood of duplication of efforts. The National Marine Fisheries Service assists with coordinating the harbor seal sampling and testing programs.

Additional funding for the operations of the Alaska Native Harbor Seal Commission has been received from the National Marine Fisheries Service and the U.S. Congress, and additional funding is being sought from these entities as well as the National Science Foundation. Such funding supports more extensive activities for the Commission across the entire range of the harbor seal in Alaska. As of April 1997, a congressional appropriation to support basic commission functions (office, accounting, travel to conferences) was being administered through NMFS. The ANHSC received a Title VIII ANILCA grant to assist in the development of co-management plans.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

No additions to project objectives or methods of the detailed project description submitted and approved for Project 00245 are being proposed. Previously, the ANHSC organized a workshop in conjunction with one of its meeting and prepared a proceedings report. This task was eliminated in FY00 in light of reduced funding. We do also not anticipate expanding the project into new communities. It is anticipated that review of project progress will still take place at ANHSC meetings. In FY 01, Vicki Vanek assumed responsibilities as co-principal investigator (along with Monica Riedel), replacing James Fall. In FY 01, other funding was secured for Monica Riedel's time and a part time assistant to the Biosampling Program has been added.

ENVIRONMENTAL COMPLIANCE

This project is, a continuation of Project 00245 which was classified as categorically excluded under NEPA guidelines. While this project will collect biological samples from subsistence-taken harbor seals, the sampling effort will not result in any additional takings of seals.

PROPOSED PRINCIPAL INVESTIGATORS

Vicki Vanek

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PERSONNEL

Monica Riedel, an Alaska Native resident of Cordova, is the executive director of the Alaska Native Harbor Seal Commission. Ms Riedel is responsible for the ANHSC activities under this project, including identifying and subcontracting with local village technicians, developing subcontracts, and developing the newsletter.

Vicki Vanek is a Wildlife Biologist with the Division of Subsistence in Kodiak. She holds a Doctor of Veterinary Medicine degree, and has worked on previous Division projects in collecting marine mammal samples and training hunters as well as on the biological sampling tasks of 96244, 97244, and 98244. Dr. Vanek is responsible for overall project performance for the Division. She will assist hunters and community technicians in biosampling, and will train newly hired technicians. Dr. Vanek will also process biosamples. She will also prepare a newsletter, which reports results of the biosampling efforts and will also coordinate preparation of annual and final reports. Four months of funding is being requested for her work on this project.

Revision - 7-1-00
Approved 7-3-00

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001
Personnel		$18.4
Travel		$3.0
Contractual		$14.3
Commodities		$0.5
Equipment		$0.0
Subtotal	$0.0	$36.2
General Administration		$3.8
Project Total	$0.0	$40.0
Full-time Equivalents (FTE)		0.3
Other Resources		

LONG RANGE FUNDING REQUIREMENTS					
			Estimated FY 2002		
			$25.0		

Dollar amounts are shown in thousands of dollars.

Comments:

FY01

Prepared: 7/1/00

Project Number: 01245
Project Title: Community-Based Harbor Seal Management and Biological Sampling
Agency: Alaska Department of Fish and Game

FORM 3A
TRUSTEE
AGENCY
SUMMARY

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2001
Vicki Vanek	Wildlife Biologist II	16A	4.0	4.6		18.4
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal	[redacted]	4.0	4.6	0.0	[redacted]
					Personnel Total	$18.4

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2001
Kodiak - Anchorage	0.3	5	15	0.1	3.0
Restoration Workshop, hunter/student trainings/sample processing					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.0

FY01

Prepared: 7/1/00

Project Number: 01245
Project Title: Community-Based Harbor Seal Management and Biological Sampling
Agency: Alaska Department of Fish and Game

FORM 3B
Personnel
& Travel
DETAIL

2001 EXXON VALDEZ TRU: COUNCIL PROJECT BUDGET

October 1, 200: - September 30, 2001

Contractual Costs:	Proposed FY 2001
Description	
4A Linkage	13.8
Air freight for shipping samples from Anchorage or Kodiak to participating sites	0.5
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$14.3

Commodities Costs:	Proposed FY 2001
Description	
Supplies for shipping and subsampling	0.5
Commodities Total	$0.5

FY01

Prepared: 7/1/00

Project Number: 01245
Project Title: Community-Based Harbor Seal Management and Biological Sampling
Agency: Alaska Department of Fish and Game

FORM 3B
Contractual & Commodities DETAIL

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2001
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY01

Prepared: 7/1/00

Project Number: 01245
Project Title: Community-based Harbor Seal Management and Biological Sampling
Agency: Alaska Department of Fish and Game

FORM 3B
Equipment
DETAIL

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001
Personnel		$3.2
Travel		$1.0
Contractual		$7.0
Commodities		$0.8
Equipment		$0.0
Subtotal	$0.0	$12.0
Indirect		$1.8
Project Total	$0.0	$13.8
Full-time Equivalents (FTE)		0.5
Other Resources		

LONG RANGE FUNDING REQUIREMENTS					
			Estimated FY 2002		
			$15.0		

Dollar amounts are shown in thousands of dollars.

Comments: Indirect = 15% of program costs

FY01

Prepared: 7/1/00

Project Number: 01245
Project Title: Community-based Harbor Seal Management and Biological Sampling
Name: Alaska Native Harbor Seal Commission

FORM 4A
Non-Trustee
SUMMARY

2001 EXXON VALDEZ TRU COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:				Months	Monthly		Proposed
	Name	Position Description		Budgeted	Costs	Overtime	FY 2001
	Monica Riedel	Executive Director		4.0	0.0		0.0
							0.0
		Note: works 1/3 time year-round on					0.0
		this project - other funding secured for salary					0.0
							0.0
	Unkown	Program Assistant		1.6	2.0		3.2
		Note: will be part-time (1/4) for 6.5 months					0.0
		at $500/month					0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		5.6	2.0	0.0	
						Personnel Total	$3.2

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FY 2001
	Exec. Director Cordova to Anchorage for restoration workshop	0.2	2	6	0.1	1.0
	and ANHSC workshop/biosampling workshop					0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$1.0

FY01

Prepared: 7/1/00

Project Number: 01245
Project Title: Community-based Harbor Seal Management and Biological Sampling
Name: Alaska Native Harbor Seal Commission

FORM 4B
Personnel
& Travel
DETAIL

2001 EXXON VALDEZ TRU{ COUNCIL PROJECT BUDGET

October 1, 200[illegible] - September 30, 2001

Contractual Costs:	Proposed
Description	FY 2001
Phone: 12 months @ $150/month	1.8
Postage: 12 months @ 50/month	0.6
Insurance	1.2
Subcontracts with community biosamplers	3.4
Training honorarium: two @ $100/each = $200	
Sample processing: 70 samples@$45/seal=$3150	
Contractual Total	$7.0

Commodities Costs:	Proposed
Description	FY 2001
Purchase replacement materials for sampling kits (knives, gloves, plastic bags) (6 kits)	0.1
Purchase new sampling kits (2 kits @ $100/kit)	0.2
Supplies for shipping samples	0.5
Commodities Total	$0.8

FY01

Prepared: 7/1/00

Project Number: 01245
Project Title: Community-based Harbor Seal Management and Biological Sampling
Name: Alaska Native Harbor Seal Commission

FORM 4B
Contractual & Commodities DETAIL

2001 EXXON VALDEZ TRU[illegible] COUNCIL PROJECT BUDGET

October 1, 200[illegible] - September 30, 2001

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2001
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage:	Number	
Description	of Units	
		[redacted]

FY01

Prepared:7/1/00

Project Number: 01245
Project Title: Community-based Harbor Seal Management and Biological Sampling
Name: Alaska Native Harbor Seal Commision

FORM 4B
Equipment
DETAIL

Approved 8-3-00 TC

Kametolook River Coho Salmon Subsistence Project

Project Number:	01247
Restoration Category:	General Restoration
Proposer:	Perryville Village Council
Lead Trustee Agency:	ADF&G
Cooperating Agencies:	NONE
Alaska SeaLife Center:	NO
Duration:	5th year, 6-year project
Cost FY 97	$31.4
Cost FY 98	$14.9
Cost FY 99	$20.8
Cost FY 00	$23.2
Cost FY 01	$22.7
Cost FY 02	$30.0
Geographic Area:	Perryville/ Kametolook River/ Alaska Peninsula
Injured Resources/ Service	Subsistence

ABSTRACT

Subsistence users from the remote South Alaska Peninsula Native Village of Perryville have noted declines in the coho salmon (*Oncorhynchus kisutch*) run in the nearby Kametolook River since the *Exxon Valdez* oil spill (EVOS). The Trustee Council began funding this project in Federal Fiscal Year 1997 with the intent of restoring the coho salmon run to historic levels. This project is a continuation of an evaluative phase of the project funded through the EVOS criminal settlement (Grant Agreement Number 2168588). Although limnological, juvenile and adult fisheries data were not available or severely limited before the salmon decline, it was determined through the evaluation phase that instream incubation boxes in conjunction with self imposed harvest limits by

subsistence users were the preferred alternatives for restoration this salmon run. In 1997, the Alaska Department of Fish and Game, Habitat and Restoration Division, aided the project by providing an Environmental Assessment. In 1997, a Finding of No Significant Impact was signed for NEPA compliance.

Community involvement by the villagers of Perryville is an integral part of restoring the Kametolook River coho as a subsistence resource. Presently, no regulations prohibit fishing in the Kametolook River; however, starting in 1997 the Perryville Village Council voluntarily closed the upper half of the Kametolook River to subsistence salmon fishing in order to not interfere with spawning salmon. In the summer of 1999, virtually no one fished in the Kametolook River for salmon. In addition, as part of the community involvement portion of the project the Perryville Village Council has hired local assistants who received training to assist ADF&G with fieldwork including: genetic and pathological sampling, incubation box installation, egg takes and incubation techniques, and year around monitoring of the boxes and environment. Also, an aquarium has been set up in the village school where students actively participate in incubating coho salmon from egg to fry stage and releasing the fry into the Kametolook River. In May 1997, 1998 and 1999, each year about 125 fry from the school aquarium project were released into the Kametolook River. In the fall of 1999, approximately 400 fertilized eggs were placed in the school aquarium and the fry are expected to be released in the Kametolook River in the spring of 2000.

In 1997, two production type instream incubation boxes were installed in the upper reach of the Kametolook River. These boxes replaced and were in addition to a small test incubation box that has successfully incubated eggs. In 1997, the Kametolook River coho escapement was an estimated 724 salmon, nearly four times the estimated escapement during 1996. The increased escapement is attributed to the self imposed closure of the upper river by the villagers, a commercial fishing closure in marine waters during nearly the entire coho salmon run, and a strong run of coho salmon in general to the Chignik area. In 1997, several attempts to capture ripe coho salmon have generally been unsuccessful; eggs from only seven females (four of which were partially spent) have been deployed in the incubation boxes.

In 1998, in order to increase the egg take, two salmon holding pens were installed near the coho salmon spawning region of the Kametolook and used to make the recovery of ripe salmon more efficient. 16 female and 15 male salmon were captured and placed in the holding pens to ripen. Seven males were used to fertilize 11 ripe females and the fertilized eggs were placed in the two incubation boxes in November, 1998. The coho salmon escapement for 1998 was an estimated 148 salmon. The decreased escapement is attributed to a weak run of coho salmon in general to the Chignik area.

In early November 1999, the two salmon holding pens were used again. 9 Female and 20 male salmon were captured and placed in the holding pens to ripen. On November 17th, the salmon held in the holding pens were again captured and eggs and milt were collected. Standard delayed fertilization techniques used and the fertilized eggs were placed into the

two egg incubation boxes. Kidney, ovarian and genetic samples were also collected. There was an attempt to estimate the escapement, however turbid waters made it impossible to determine.

INTRODUCTION

This subsistence project is designed to restore coho salmon subsistence opportunities in the Alaska Peninsula village of Perryville. The project was initiated during community workshops held by the Subsistence Restoration Planning Team. Workshops in Perryville took place in September 1994 and May 1995. The project was subsequently endorsed by the Perryville Village Council. The project was also discussed and endorsed by the Chignik Regional Planning Team in the spring of 1995 and again in December 1996. Alaska Department of Fish and Game, Division of Commercial Fisheries, westward region staff assigned to the Chignik and Alaska Peninsula regions and the Division of Subsistence, have been involved in the planning and development of the project. In addition, an ADF&G biologist in the Norton Sound Region has provided technical expertise regarding the use of both instream incubator boxes and recirculating water incubators, which have been successful in the Norton Sound Region. Alaska Department of Fish and Game, Division of Habitat and Restoration staff have also been involved with the project, especially with the development of an Environmental Assessment.

In 1996, funding for the evaluation phase of the project was provided through a grant to the Native Village of Perryville by the Alaska Department of Community and Regional Affairs, using EVOS criminal settlement funds. During consultation about this grant, the State members of the Trustee Council requested that a proposal to the full Trustee Council be prepared to support the implementation of the project in subsequent years. This was accomplished and the Trustee Council began funding this project in Federal Fiscal Year 1997. The Environmental Assessment was approved and the resulting FONSI for this project was received by the Trustee Council in May, 1997.

It has been determined by the assessment team (PI's, Habitat and Restoration, and Perryville Village Council) that local salmon stock instream incubator boxes are the best method to help restore Kametolook River coho salmon runs. Applications for ADF&G fish transport permits are reviewed annually and a general habitat waterway/waterbody application has been granted for this project. In 1997, an environmental assessment was completed with a Finding of No Significant Impact signed for NEPA compliance. Samples of adult coho salmon will continue to be collected for genetic and pathology data until sufficient numbers are obtained. The assessment team will work with the Principal Geneticist, Principal Pathologist and Area Management Biologist to have the most safe and satisfactory project possible to help restore coho salmon in the Kametolook River to historic levels.

NEED FOR THE PROJECT

A. Statement of Problem

Since Perryville was founded in 1912, the Kametolook River has provided the community with much of its supply of subsistence coho salmon. Since the *Exxon Valdez* oil spill,

Perryville residents have noted that there are fewer and fewer coho salmon in the river. It has become such a problem that many families must travel further away from Perryville to find sufficient amounts of salmon. Their use of these other areas has put additional pressure on fish stocks used for subsistence by the neighboring villages of Ivanof Bay, and the three Chignik villages.

Salmon are very important for Native people of Perryville, and are relied on greatly for their subsistence as well as economic livelihoods. Commercial fishing is the mainstay of Perryville's cash economy, where many residents travel to fish camps in Chignik Lagoon and Chignik Bay in the summer months to commercial fish, as well as to put up fresh sockeye salmon for smoking, canning or freezing. Those people who spend summer months in Chignik return to Perryville in the fall to put up coho salmon that are also smoked, as well as dried. Many other Perryville residents, however, do not commercial fish and stay in Perryville year around. Gradually throughout the summer, they travel to the Kametolook River to catch their year's supply of subsistence salmon that are primarily coho, pink, and chum salmon. (Sockeye, estimated at fewer than 100 adults annually, also spawn in the Kametolook River.)

Division of Subsistence personnel first did research in Perryville in 1984. Starting in 1990, the division has documented concerns by local residents that coho salmon availability in the Kametolook River is far below historical levels. Fish and Game biologists working in the Chignik region believe coho salmon stocks in the Kametolook River might be depressed, but have little data regarding historic or present escapement levels for this small, remote river.

B. Rationale/Link to Restoration

Salmon runs to the Kametolook River have been declining in recent years. Members of the village of Perryville requested the EVOS Trustee Council to fund a restoration project and they asked ADF&G to assist with this project. The cause of the decline in salmon numbers is unknown. A restoration project cannot be successful unless the cause of the decline is understood and the project is "fixing" the "right problem". An appropriate salmon restoration project will hopefully increase Kametolook River coho salmon relied on for subsistence by Perryville people back to historic levels. If more fish are available for subsistence, it will not only provide people with more coho salmon, but it will also take pressure off of other subsistence resources that were hurt by the spill, such as other salmon species, clams, seals and sea lions, as well as recent declines of local caribou.

C. Location

The remote Native village of Perryville is located approximately 500 air miles southwest of Anchorage on the Pacific side of the Alaska Peninsula. Veniaminof Volcano overlooks the village that is situated directly along the Pacific Ocean coastline with beaches of volcanic black sand. The Kametolook River is located four miles northeast of Perryville, and is easily accessible from the community via ATV, foot, or boat.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

The Trustee Council's goal of achieving additional local public involvement in the restoration process is addressed in that Perryville will be a partner with ADF&G personnel in this project. This project has been discussed and endorsed by the Chignik Regional Planing Team and the Perryville Village Council. Through project funds, the Perryville Village Council is responsible for hiring local assistants, and providing necessary logistical support for the operation of this project. The community has also contributed much in terms of local knowledge of the environment, including: historic to contemporary salmon run timing and numbers, subsistence harvest levels over time, identifying physical changes to the Kametolook River over time, helping ADF&G identify spawning and rearing areas, and identify potential characteristics of the river, such as where winter freeze over or spring and fall flooding might occur.

Several residents of Perryville have worked with ADF&G during assessment and implementation phases of the project. In addition, local assistants will monitor the project throughout the year, when ADF&G personnel will not be present. Local assistants through hands-on involvement have been trained by ADF&G personnel to monitor temperature and water level stations, to monitor the egg incubation boxes, participate in egg takes for seeding the incubation boxes, transporting eggs to the classroom incubator, and will transport fry to nearby lakes or adjacent rivers (depending on what the current review of the Fish Transport Permits allows).

Perryville residents have been kept informed about the progress of the project through the Village Council and village meetings. During these meetings residents have been informed about salmon run strengths, harvest levels, and rearing and habitat issues. The community has been encouraged to come up with ways that they can contribute toward restoring the coho run. Presently, no regulations prohibit fishing in the Kametolook River; however, starting in 1997 and continuing through 1999, the Perryville Village Council voluntarily closed the upper half of the Kametolook River to subsistence salmon fishing in order to not interfere with spawning salmon. A subsistence salmon household survey in Perryville for the 1999 season determined that virtually no one fished the Kametolook River for subsistence salmon, because people were concerned about the fish populations.

School children have had opportunities to learn, understand and appreciate the complexities of the growth cycle of salmon through the use of a classroom aquarium that is raising coho salmon from egg to fry stages. Fish resource permits have allowed the release of these fry into the Kametolook River (1996-2000). In addition, when allowed by the teachers and parents, older school children have accompanied ADF&G personnel to the Kametolook River and nearby lakes to assist with minnow trapping and biological and habitat sampling. This portion of the project has been in operation for three winters now, and expected to continue through 2002 and possibly beyond if the school continues to support the program.

PROJECT DESIGN

The primary goals of the project are to increase the coho salmon runs to the Kametolook River and to include the people of Perryville through involvement in the project and education. The method(s) used to accomplish this have been determined in 1996 and 1997 by a team of ADF&G specialists, and local Perryville residents. Funding for the first portion of the project was provided through a grant to the Native Village of Perryville from the criminal settlement funds. Beginning in Federal Fiscal Year 1997 funding has been provided by the Trustee Council. Personnel involved with the project have determined that the most appropriate rehabilitation method is through the use of instream incubation boxes. The team has acquired all the necessary permits (with the exception of the school aquarium Fish Transport Permit that is submitted to ADF&G for review annually). The Environmental Assessment and a Finding of No Significant Impact by the US Fish and Wildlife Service was approved in May of 1997. This project has the potential to make restoration of coho salmon in the Kametolook River possible. Similar projects in other regions of Alaska have proven to be successful.

In addition to school and village meetings where salmon life cycle processes were described instream incubation boxes have been determined to be the preferred restoration method. A test incubation box was positioned in a head water tributary of the Kametolook River to use the natural flow of water from the stream to incubate coho salmon eggs. This portion of the project has been successful; swimup fry were produced during April 1997. In the production phase of this project, genetic integrity of the Kametolook River coho salmon will be assured under the guidance of the department's Principal Geneticist. The potential incubation site has water temperatures consistent with natural spawning sites to insure that fry development and emergence occur at the same time as naturally occurring fry. The small scope of this project is not expected to noticeably add any coho salmon to other common property harvest groups (i.e. commercial fisheries).

From similar projects in Norton Sound, it has been found that improved returns were noticeable in about five years. If the number of coho salmon spawners is sufficient to allow an egg take, instream incubators will be employed. (Fish Transport Permits will require a minimum of 60 naturally spawning pairs before an egg take can occur and then 50% of the escapement above the 60 spawning pairs will be available for an egg take.) In 1998 and beyond, the use of salmon holding pens will be used to make the recovery of ripe salmon easier. The incubators are expected to operate annually from 1997 through 2002. Since a major expense is in the boxes (materials and installation), and establishing an incubation site, the annual cost of operation and maintenance is not significant.

Other restoration methods evaluated included a recirculating water incubation facility in the village, potential habitat manipulation to create or provide access to better spawning and rearing habitats, and a remote incubation facility. All of these alternative methods were rejected in favor of the instream incubators.

A. Objectives

There are two main project objectives: the first is community involvement described above, and the second is to restore the coho salmon returns to the Kametolook River and provide local subsistence salmon opportunities. The species of interest for this project is coho salmon. Phase 1 of the project included a complete assessment of the creek and river habitat in proximity to Perryville and interviews to determine salmon run strength, run timing and physical changes to local drainages. Phase 2 (1996) included installation and testing of a streamside incubation box, continuation of the classroom aquarium and education programs for adults and high school students. Phase 3 so far has included installation (August/September 1997) of large capacity streamside incubation boxes, installation and use of the school aquarium, education programs, and biological sampling for pathological and genetic testing. Phase 3 will continue through the end of the project with biological testing (until required amount necessary are obtained for genetic and pathology tests), annual egg takes for the incubation boxes and the school aquarium, continued education and habitat and harvest monitoring.

B. Methods/ May 1996-September 2000

May 1996 through September 1996/ This phase of the project was funded through the Criminal Settlement/ Project Perryville 96-1.

May 1996- Three ADF&G assessment team members traveled to Perryville and joined with local assistants to assess the Kametolook River in order to make recommendations for the best restoration efforts. A small instream test incubator box (2 foot square plywood box) was installed at the headwaters of the river. The incubator box was also equipped with a thermograph to aid in determining the potential of the incubation site. Thermographs were also installed at three other habitat-monitoring locations along the Kametolook River. Perryville guides showed the ADF&G team the different stream reaches; at this time, there was no evidence of blockages to adult or smolt migration. Blockage and breaching events apparently occur on a scale of about 2-10 years. ADF&G personnel were given the impression that the river has relatively unstable spawning areas with current upstream spawning sites improved from prior years. Young-of-the-year and fingerling coho were observed in several slough habitats and small ponds. Several ponds, deep main-stem pools, side-channel sloughs and spring areas apparently do not freeze solid and would provide over winter rearing habitat. During this trip preliminary investigations were also undertaken for possible stocking of rainbow trout or coho salmon into two landlocked lakes (Sandy and Sicken Lakes) in proximity to Perryville. At the high school ADF&G personnel discussed potential education projects such as a classroom salmon aquarium and recirculating egg incubators. (A detailed field trip report is available.)

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Project 97247 (October 96-September 97)

October 1996- Three ADF&G assessment team members traveled to Perryville and joined with local assistants to expand the habitat surveys of drainages adjacent to Perryville, to place fertilized eggs in the experimental stream side incubation box and to initiate a cooperative educational program in the Perryville school. Local guides showed us much of the historic and potentially productive reaches of the Kametolook, Three Star and Long Beach Rivers. Long Beach River, although historically productive, presently had no quality spawning or rearing habitat. Three Star River, smallest of the three drainages, had some stable reaches but about half of the discharge had changed course and currently flows into Long Beach River. Some potential rearing habitat is present while spawning habitat appeared to be limited. Kametolook River currently showed the most salmon spawning and rearing potential. However, this system is dynamic and habitat quantity and quality may change annually.

Minnow trapping was conducted in all three drainages. Rearing and spawning habitat in Long Beach River appeared to be negligible. Three Star River had limited high quality slough habitat and supported juvenile coho salmon and Dolly Varden; spawning habitat appeared to be limited to several short stream reaches. Rearing habitat for juvenile coho salmon in the Kametolook River appeared to be quite abundant while upper stream reaches seemed able to support relatively good numbers of spawning salmon. Several high school students assisted with coho fingerling data collection efforts.

A total of 32 adult coho salmon were collected from the Kametolook River during this trip. Few other adult salmon were seen. Genetic and kidney samples, otoliths and scales were taken from each salmon. All observed coho salmon appeared to be recent arrivals to the river and were not ripe; seeding fertilized coho eggs into the incubation box was not possible. High school students, in addition to assisting with fingerling sampling, also explained the field trip experience to their fellow students. Each presented some aspect of the field studies and the ADF&G team participated by asking questions and explaining details. ADF&G personnel also demonstrated scale reading techniques and presented representative samples of all species collected from the minnow traps. Plans were developed with the science teacher to install and permit a classroom aquarium incubator for coho salmon eggs. (A detailed field trip report is available.)

November 1996- Two ADF&G assessment team members traveled to Perryville and joined with local assistants to capture and spawn one pair of coho salmon for the incubation box in the Kametolook River. Gillnetting captured about 20 salmon including 4 sockeye, 13 male coho and 3 female coho salmon. Following standard delayed fertilization techniques, the eggs were fertilized and seeded into the incubation box. A thermograph was deployed in the substrate near the largest group of spawning salmon. Although only a one time event, a survey to enumerate spawning coho was conducted. About 75% of all observed coho were located within 1 mile downstream of the incubation box; the remaining 25% were scattered in small groups throughout the remainder of the drainage.

The total observed coho escapement was about 100 salmon with no ocean bright salmon observed. The subsistence harvest continued, and the observed escapement might have been higher than the actual spawning escapement. (A detailed field trip report is available.)

At the high school the ADF&G team assembled the aquarium incubator. When the eggs reach the eyed stage, about 250 eggs from the stream side incubator were transferred to the classroom incubator (January ADF&G field trip). (A detailed field trip report is available.)

January 1997- Two ADF&G team members traveled to Perryville. While waiting in King Salmon for the flight to Perryville they met with the Alaska Peninsula/Becharoff National Wildlife Refuge staff to discuss the Kametolook project and review the draft Environmental Assessment. In Perryville, they joined local assistants and checked the thermograph and staff gauge sites, shocked the incubating eggs, discarding dead eggs, and sorted out about 250 eggs which were transported to the school aquarium. An approved Fish Transport Permit allowed 250 eggs to be raised in the school aquarium and the release of any resulting fry back into the Kametolook River. With the assistance of five high school students the team measured physical characteristics of two landlocked lakes as potential coho fry or rainbow trout release sites and collected gravel for alevin habitat in the aquarium. A slide show of the restoration project and discussion of the life cycle of salmon was presented to all Perryville students. ADF&G personnel also attended a meeting sponsored by the Village Council where they presented a similar slide show. At the village meeting the restoration project and the school aquarium were discussed as well as the life cycle of coho salmon, the 1996 coho salmon escapement, and potential production from the escapement. (A detailed field trip report is available.)

March-May 1997- ADF&G personnel drafted an Environmental Assessment of the Kametolook River Coho Salmon Restoration Project. A FONSI was developed and in May was signed for NEPA compliance. A Habitat Permit was reviewed and accepted which allows the instream incubation boxes to be deployed. Fish Transport Permits were drafted for review to insure that management, genetic, and pathology concerns are addressed. Approximately 125 coho salmon fry were released into the river of origin (Kametolook) from the school aquarium project (Fish Resource Permit P-97-021).

June-July, 1997- Received appropriate fish transport permits from ADF&G for harvesting salmon eggs and releasing fry from incubation box and school aquarium for the 1997/98 season. Purchased materials for two incubation boxes and constructed them for later use. Met with the Chignik Regional Planning Team, Chignik Regional Aquaculture Association and public to development a Western and Perryville Districts coho salmon management plan.

August 1997- Transported incubation boxes to Chignik Bay (ADF&G M/V Resolution) and local Perryville resident transported them to Perryville via fishing boat.

September 1997- Two Perryville personnel were trained (2 weeks) at Pillar Creek Hatchery (Kodiak) in spawning and incubator maintenance techniques. Two ADF&G staff attempted to travel to Perryville to install the two incubation boxes in Kametolook River, sample salmon and trout for age, length and abundance data, however weather prevented them from traveling beyond Chignik Lake. In late September, two Perryville assistants transported two egg boxes and other necessary equipment up Kametolook River to the installation site.

Project 98247 (October 97-September 98)

October-November 1997- The Perryville Village Council voluntarily closed the spawning areas of the Kametolook River to fishing (October 3). One ADF&G personnel traveled to Perryville October 31 through Nov. 6. On this trip ADF&G personnel 1) set up the school aquarium for incubation of coho salmon from egg to fry stages, met with the teachers and this year's upper class members and instructed them on classroom salmon incubation techniques; 2) discussed with the local assistants the placement of thermographs for the fall/winter/spring period of 1997-1998; 3) estimated the total coho salmon escapement to the Kametolook and Three Star Rivers; 4) with help of three local assistants, installed two production type salmon incubation boxes in the Kametolook River; 4) attempted a coho salmon egg take for the incubator boxes and the school aquarium 5) took samples of adult coho salmon for genetic and pathology data. Only two ripe and no spawned out fish were caught and added to one of the egg incubation boxes. Because of the lack of success finding ripe and spawned out salmon, it was decided that four local Perryville assistants would attempt additional egg takes through November.

Local Perryville assistants took 10 additional trips at different stream locations and several sets per day to capture ripe coho for the incubation boxes without much success (total catch: 7 females, 4 of which were partially spent) which were added to the incubation boxes. The problem was not in catching fish, but in catching ripe ones. Samples were taken for pathology and genetic testing from males and females harvested for sampling. They reinstalled and deployed thermographs at designated sites.

December 1997- The assessment team decided to install fish holding pens in 1998 to aid in capturing ripe salmon for egg incubation boxes. Perryville assistants traveled to egg incubation boxes and removed approximately 300-eyed eggs that were put inside the school aquarium.

January-March 1998- Perryville assistants took monthly monitoring trips to Kametolook River to check thermograph sites and egg boxes. Approval to release fry in Kametolook was denied by ADF&G Pathologist due to low number of females harvested; however, approved was granted to release them in local landlocked Sicken and Sandy Lakes in late April or May. The Perryville teacher communicated with ADF&G regarding status of eggs in aquarium. Survival fry from school incubation box will be transported and released in the Kametolook River in late April or May. Two net holding pens were acquired, and prepared for transport to Perryville in May. Present staff attended the State Board of Fisheries meeting and gave staff report regarding the project. They also attended Chignik RPT meeting and provided a project status

report. The RPT continued to support project. A fish transport permit request was submitted to ADF&G for review.

Project 99247 (October 98-September 99)

October 1998- Jim McCullough participated in a field trip on 21 through 27 October 1998, to Perryville, Alaska. The purpose of the trip included: 1) to install temporary ripening pens for coho salmon, 2) foot survey of salmon in the Kametolook River, 3) capture and place in holding pens adult coho salmon, 4) clean the instream incubation boxes, 5) clean the school salmon egg incubation aquarium, and 5) collect and down load remote thermographs.

October 23, 1998- Jim McCullough along with the assistance of Jerry Yagie and Bruce Phillips installed holding pens for ripening coho salmon in a side pond of the Kametolook River. The Kametolook River was also surveyed for adult salmon. Approximately 70 coho and 25 sockeye salmon were observed in the main upriver spawning area located about ¼ mile below the incubation boxes. An additional 4 coho salmon were counted in the main stem of the river below the main spawning site and an additional 15 sockeye salmon in Candlefish Slough. The indexed escapement count for the Kametolook River is 148 coho salmon and 40 sockeye salmon. The indexed count for coho is twice the observed count (sockeye estimate not expanded). Although the river was somewhat turbid below the main spawning area, it was also obvious that there were few salmon present.

October 24, 1998- 16 female and 15 male coho salmon were caught and placed in the holding pens to ripen. The instream incubator boxes and water head collector boxes were cleaned and disinfected. The Three Star River was also visited where 5 adult coho salmon were spotted. Jim McCullough met with the new science teacher, Patsy Chapple and discussed report requirements and the permit process for running the school aquarium, and cleaned, disinfected, and filled the aquarium with fresh water and turned the chiller on.

October and November 1998- Jerry Yagie conducted weekly stream surveys of the Kametolook for the presence of coho.

November 1998- Jim McCullough and Melvin Chya participated in a field trip on 9 through 13 November 1998, to Perryville, Alaska. The purpose of the trip included: 1) foot survey of salmon in the Kametolook River, 2) spawn adult coho salmon that were ripening in holding pens, 3) fertilized and place coho salmon eggs in the Kametolook River incubation boxes, and 4) fertilize and place coho salmon eggs in the school aquarium. Melvin Chya works at the Pillar Creek Hatchery in Kodiak, Alaska.

November 10, 1998- Jim, Melvin and Jerry Yagie checked the Kametolook River incubation boxes to insure they were operating properly for the next days-planned egg take. The holding pens where checked for adult ripening coho salmon and noticed that the adult male salmon had escaped, the female salmon were still captive in their pen. The Kametolook River was surveyed again for adult salmon with approximately 20 coho and

10 sockeye salmon in the main upriver spawning area located about ¼ mile below the incubation boxes observed. None of these salmon appeared fresh and were likely counted during the 23 October salmon survey. The indexed escapement count for the Kametolook River should remain at 148 coho salmon and 40 sockeye salmon, the survey count from 23 October.

November 11, 1998- Jim, Jerry, Melvin, Austin Shangin caught 7 male coho salmon from the Kametolook River and used them to fertilize the 11 ripe female coho salmon from the holding pen. Standard salmon delayed fertilization techniques were used and the fertilized eggs were immediately rinsed and placed in the instream incubators. All but about 300 unfertilized eggs which were held back for the school aquarium, were distributed between the two instream incubator boxes. Fin and kidney samples were collected form each salmon for genetic analysis and disease screening, and ovarian samples were collected from each female salmon for disease screening.

November 12, 1998- Jim and Melvin showed all the Perryville students from kindergarten through the sixth grade how to fertilize salmon eggs. After fertilizing the eggs, they were placed them in the school aquarium where the students will be able to watch their development through the swim up fry stage and their release into the Kametolook River in the spring of 1999.

November 13, 1998- Genetic samples were delivered to U.S. Fish and Wildlife laboratory in Anchorage and kidney and ovarian samples taken to Anchorage Alaska Department of Fish and Game laboratory for testing.

November 1998 through April 1999- Jerry Yagie continued to conduct BI-monthly trips to the instream incubation boxes to check their condition. He provided reports to the ADF&G staff.

January 1999- Jim McCullough attended the State Board of Fisheries meeting and gave a status report of this project.

March 17-19, 1999- Jim McCullough and Lisa Scarbrough attended Chignik RPT and CRRAA meeting and provided project status report of project. A Perryville Subsistence Workgroup was created consisting of representatives from: Perryville, Chignik commercial fisherman and ADF&G staff members to look into identifying ways (in addition to the incubation boxes) to assist with the recovery of coho salmon in the Kametolook River.

March 23-26, 1999- Jim McCullough and Lisa Scarbrough constructed a project poster for the 1999, 10th annual EVOS conference "Legacy of an Oil Spill 10 Years After *Exxon* Valdez". Attended the conference and presented the poster during the scheduled poster session.

April 9, 1999- Jim McCullough and Lisa Scarbrough participated in a teleconference with the Perryville Subsistence Workgroup. The Kametolook River project was discussed.

April 29- May 4, 1999- Lisa Scarbrough traveled to Perryville with Jim McCullough to issue subsistence salmon permits and conduct key respondent interviews. The interviews were designed to further investigate the subsistence salmon fishery in Perryville as requested by the Perryville Subsistence Workgroup. Topics discussed in the interviews were directed at trying to learn how each salmon stock contributes toward meeting the salmon needs of Perryville, and alternative subsistence resources available. Life histories were also gathered for several respondents to document stocks used over time, locations of harvests, and ways each species is processed and cooked. Jim McCullough and local assistants attempted to travel to the incubation boxes on the Kametolook River, but heavy wet snow halted the trip.

Project 00247 (October 99-September 00)

September-October 1999- Local Assistant, Jerry Yagie conducted stream surveys, counting coho in upper reaches of Kametolook River. Reports information to ADF&G's Jim McCullough.

October 25, 1999- Teleconference with ADF&G and the Perryville Subsistence Workgroup. The Kametolook Coho Restoration project was discussed.

October 28, 1999- Jim Fall (ADF&G Division of Subsistence) attended the Alaska State Board of Fisheries meeting in Fairbanks and gave a status report of the Perryville Subsistence Workgroup including the Kametolook project.

November 1-5, 1999- Jim McCullough participated in a field trip to Perryville, Alaska. The purpose of the trip included: 1) survey Kametolook River's salmon escapement, 2) set up holding pens for ripening adult coho salmon, 3) captured and placed in holding pens adult coho salmon, 4) cleaned and set up the coho salmon school aquarium project and 5) met with villagers to determine how the 1999 salmon subsistence fishery was proceeding.

November 1-2, 1999- Travel for Jim McCullough from Kodiak to Perryville via Anchorage and King Salmon.

November 3, 1999- Bad weather prevented travel to the Kametolook River spawning area so Jim McCullough spent the day cleaning and setting up the school aquarium and met with the junior and high school teachers to discuss the school aquarium project.

November 4, 1999- Jerry Yagie, Jim McCullough and one high school student, Michael Shangin set up the holding pens in the spring above the Kametolook River incubation boxes. They also surveyed the Kametolook River for the presence of any fish. In the spring of 1999, about 75% of the glacial water that had been flowing into the Long Beach River changed course and began flowing into the Kametolook River. The additional flow nearly doubled the size of the Kametolook River and made extremely poor salmon survey

conditions due to turbidity. They observed only 3 coho salmon immediately below the incubation box site, an additional 6 coho salmon in the main stem and 5 coho salmon in clear water tributaries. Jerry noted that in one clear tributary, where they saw only 2 sockeye and one coho salmon, he had observed 20 coho salmon about two weeks earlier. They also saw 10 sockeye salmon in the main stem of the river.

November 5, 1999- Jerry Yagie, Michael Shangin and Jim McCullough captured 6 female and 16 male coho in the stream reach just below the incubation boxes. They kept and put in the holding pens all 6 females and 13 male coho salmon. They were surprised by this catch because we had only observed 3 salmon the previous day in this area. The glacial melt water made the survey conditions very poor.

During this trip Jim asked several people about the on-going coho salmon subsistence fishery. He was informed that fishing in Sleepy Hollow and Humpback Bay was slow while Anchor Bay and Ivan River fishing was generally good. One person said they had just returned from Chignik Lake with 96 "red" sockeye salmon from the Clark River and that their fishing partners had also taken about 100 fish each for a total of ~300 sockeye salmon. People also noted that the coho run to Ivanof was good with plenty of fish for that village. Jim returned to Kodiak, the evening of November 5.

November 9, 1999- Jerry Yagie and another person caught 3 female and 7 male coho salmon and added these to the holding pens.

November 10, 1999- Jim also presented a paper on the Kametolook project at the annual meetings of the American Fisheries Society in Anchorage.

November 15-19, 1999- Jim McCullough participated in a field trip to Perryville, Alaska. The purpose of the trip included: 1) a coho salmon egg take from the Kametolook River's salmon stock, 2) collecting biological samples from the salmon used in the egg take, 3) winterizing the holding pens and other equipment and 4) placing fertilized eggs in the incubation boxes and in the school aquarium.

November 15-16, 1999- Travel for Jim McCullough from Kodiak to Perryville via Anchorage and King Salmon.

November 17 1999- Jerry Yagie, Austin Shangin, five junior and high school students (Boris Kosbruk, Alec Phillips, Harry (JR) Kosbruk, Ryan O'Domin and Jonathan Kosbruk) and Jim McCullough collected eggs and milt from the coho salmon that had been placed in the holding pens. They also collected kidney, ovarian and genetic samples. Standard delayed fertilization techniques were used and the fertilized eggs were placed in the incubation boxes. About 400 eggs from a singe female and milt from 2 males were held back for the school aquarium. The holding pens and other equipment that was no longer needed was winterized at Jerry Yagie's house.

November 18, 1999- Jim McCullough met with the grade school and high school students that did not participate during the previous days egg take. Again using standard delayed fertilization techniques; the eggs were fertilized and added to the aquarium. Students got to watch the process and a discussion of the care of the eggs and aquarium followed. Jim returned to Anchorage that evening arriving about 8:30 p.m.

November 19, 1999- Jim McCullough dropped off the kidney and ovarian samples at the ADF&G lab and the genetic samples at the US Fish and Wildlife lab in Anchorage. He returned to Kodiak that evening.

November 1999 through May 2000- Jerry Yagie continued to conduct bi-monthly trips to the instream incubation boxes to check their condition. He provided telephone reports to the ADF&G staff.

January 2000- Jim McCullough presented a paper at Annual EVOS Restoration Workshop in Anchorage summarizing the Kametolook project. His presentation emphasized the project's community involvement. The poster created for the EVOS 10th annual conference in 1999 was displayed again at 2000 annual workshop.

April 4, 2000- Jim McCullough participated in a teleconference for the Chignik RPT and CRRAA meeting and provided project status report of the project.

April 2000- Jim McCullough and Lisa Scarbrough (PI's) met via teleconference April 6 to discuss the progress of the project and identify measurable tasks for FFY-2001. Prepared project DPD for 2001 funding.

SCHEDULE

A.1. Measurable Project Tasks remaining for FY 00 (May 2000- September 2000)

May 2000:
- Fry from school aquarium expected to be released into the Kametolook River in early to mid May. Instream incubation boxes will be removed from the river and cleaned by local assistants after fry have left the boxes (April or May).
- ADF&G personnel will travel to assist with the project and meet with Perryville Village to evaluate the project, and discuss community involvement activities.

June 2000:
-Chignik Regional Planning Team will meet in Chignik. A status report of the Kametolook Project and Perryville Subsistence Workgroup will be given.
-Complete annual report 99247.

A.2. Measurable Project Tasks for FY01 (October 2000 - September 2001)

Oct./Nov. 2000:

-Local Perryville assistants will conduct stream surveys for coho salmon in Kametolook River, and report findings to ADF&G.

-One ADF&G personnel will travel to Perryville to capture adult coho salmon (assisted by 2 or 3 Perryville assistants) and place in holding pens until salmon are ripe.

-ADF&G and PV assistant will conduct stream surveys of Kametolook River.

-Consult with teachers and set up school aquarium and obtain FTP.

-Perform maintenance of instream incubation system and school aquarium.

Nov./Dec. 2000:

-Two people (Jim McCullough ADF&G and Pillar Creek Hatchery Specialist and/or Lisa Scarbrough) travel to Perryville:

-Meet with Perryville personnel and conduct escapement surveys.

-Hatchery Specialist will conduct additional training for Perryville assistants and evaluate project/ make recommendations.

-Perform a coho salmon egg take, fertilize eggs, place in incubation boxes.

-Sample salmon for genetic and pathology tests.

-Meet with school children and community to discuss project.

-Renew school aquarium FTP.

-Meet with Chignik RPT/ CRAA and the Perryville Subsistence Workgroup to discuss the Kametolook Project.

Dec. 2000-May 2001

-Perryville assistants make monthly trips to incubation boxes to inspect condition of boxes and eggs.

-ADF&G analyze subsistence and commercial harvest data.

- Attend EVOS annual restoration workshop. Anchorage.

April/May 2001:

- Meeting with assessment team to evaluate the project.
- Write DPD proposal for FY02 and FY 00 annual report.
- Meet with community to review status of project and discuss community involvement activities.
- Purchase and ship to Perryville any necessary equipment needed for project maintenance.
- Perryville assistants monitor boxes for fry release.
- Sanitize boxes after fry leaves.
- Students release aquarium fry into Kametolook River.

June-Sept. 2001:

- Regional Planning Team meeting in Chignik Bay to review status

of the project and Perryville Subsistence Workgroup.
-Perryville assistants conducts stream surveys.

B. Project Milestones and Endpoints

Annually through the duration of the project: One day every month, one or two trained Perryville researchers will return to the Kametolook River to monitor the environment, the egg boxes, net pens and conduct general stream surveys (counting adult salmon). ADF&G will continue to supervise the project and continue to take trips to assist with the project. As this project continues; however, (up through 2002) Perryville assistants will continue to be better trained and will take on additional responsibility for the project. Some of their duties will include: conducting escapement surveys, netting salmon for holding in pens, harvesting and fertilizing eggs and transporting to egg boxes, taking samples of harvested salmon for genetic and pathology tests, assisting school children with obtaining eyed eggs for the school aquarium project, and releasing fry in the spring. (This is necessary because of budget constraints preventing ADF&G from being present at all critical times of the project.)

Annually, ADF&G staff will evaluate the Kametolook coho runs through subsistence harvest reports, evaluate incubator performance and stocking levels, perform egg takes, stocking, update project plan, review FTPs and FRPs, provide annual peer review and write annual reports. ADF&G biologists will determine any significant changes to the coho salmon spawning and rearing habitat of the rivers to determine appropriate stocking levels. ADF&G will also evaluate the use of Kametolook River coho salmon as brood stock and the release of fry back into the Kametolook, Three Star, and Long Beach Rivers and other potential stocking sites include Sandy and Sicken Lakes.

In order to rehabilitate the coho salmon run in the Perryville area, education of villagers through a better understanding of the life cycles and conservation of salmon is essential and will continue every year. The ADF&G team will assist with an educational process that focuses on teaching the community through the both the school children and adults. They plan to continue working with the community and teachers and help with this process. Results from all samples will continue to be shared with the school and community.

In conjunction with all other aspects of this project, the ADF&G team will continue to work with the Village Council to assess the project and look at ways the community can facilitate the success of the project and help increase the number of spawning coho salmon. As mentioned earlier, as of October 1997, Perryville Village Council voluntarily closed the upper half of the Kametolook River to salmon fishing as a way to do their part at helping solve the salmon shortage problem.

In 1999, virtually no one from Perryville chose to catch any of their subsistence coho from the Kametolook River to help with the rehabilitation of it's salmon runs. In addition, Chignik commercial fisherman delivered two loads (approximately 800) of fresh coho

salmon to Perryville residents in August (given mostly to the elders). This delivery was greatly appreciated, and also took some of the pressure off of the Kametolook River. This action was in part due to recommendations made by the Perryville subsistence workgroup which consists of representatives of Perryville subsistence users, Chignik commercial fisherman and ADF&G staff. The workgroup was created in 1999 (recommended by the Alaska State Board of Fisheries) in order to assist Perryville with the rehabilitation of their declining coho salmon stocks (in addition to this incubation box project). These actions as well as other options will be evaluated and discussed with the community annually on a regular basis.

The ADF&G team expects the stream side incubation boxes, in conjunction with some fishing restraints, and the Perryville subsistence workgroup will provide sufficient coho salmon to rehabilitate the run within two to three life cycles. In addition to the Kametolook River, coho fry from the incubation boxes and school aquarium could also be stocked in both landlocked lakes (Sandy and Sicken), as well as nearby Three Star and Long Beach Rivers (approved by ADF&G FTP reviewers).

C. Completion Date

The project is anticipated to be completed by September 30, 2002. If another source of funding can be obtained after that date and the community of Perryville is still interested in participating, it is recommended that the project continue indefinitely.

Cooperating Agencies, Contracts, and Other Agency Assistance

Perryville

Perryville Village Council has hired a local project administrator to track the project, arrange for logistical support, and assist ADF&G with field work and long term monitoring of the project. Three additional Perryville residents have been hired (by the Village Council) to work annually, as needed, to assist ADF&G and the project administrator with building and hauling materials, maintenance of installed egg boxes, site selection and installation of fish holding nets. Local assistants will also help with capturing adult salmon, taking genetic and pathology samples, removing, fertilizing, and seeding eggs into incubation boxes, and releasing fry in spring. Village assistants will also need to continue providing a skiff and 4-wheelers as needed. The project administrator is responsible for checking the boxes and habitat monitoring sites throughout the winter to insure they are operating efficiently, and safe from natural or human harm. Wages for the four village assistants have been included in the cost of the grant.

Alaska Department of Fish and Game

Several ADF&G personnel have provided technical assistance for the history of the project to date. These people include: Jim McCullough, Fish Biologist III for Commercial Fisheries, Kodiak, and Lisa Scarbrough, Subsistence Resource Specialist II for Subsistence, Anchorage. Personnel assisting the project include: Bill Hauser, Fish Biologist IV for Habitat and Restoration, Anchorage; Joe Sullivan (retired), Fish Biologist III for Habitat and Restoration, Anchorage, Dave Owen (retired), Fish Biologist III, Chignik/Kodiak; George Pappas, Fish Biologist III, Chignik/Kodiak; Wayne Dolezal, Habitat Biologist III for Habitat and Restoration, Anchorage and Pete Velsco (retired), Fish Culturist II for Commercial Fisheries, Nome.

Jim McCullough with ADF&G has several years of varied experience with fisheries enhancement and research projects as well as salmon management in the Alaska Peninsula. Lisa Scarbrough, has been doing subsistence research in the Alaska Peninsula (including Perryville) communities since 1989. Bill Hauser along with Joe Sullivan (now retired) have extensive experience in fisheries restoration and enhancement with the department. George Pappas replaced Dave Owen (retired 1999) as Chignik's Area Management Biologist in 1999. Both Dave and George have had several years of experience with fisheries in Alaska. Wayne Dolezal is one of the State's leading experts on Alaska. Pete Velsco (retired 1997) had several years of varied experience with instream and recirculating incubation box projects, particularly in Norton Sound. Labor (with the exception of .5 months/year for Lisa Scarbrough) will be provided by ADF&G as part of their normal salary, however, transportation costs and per diem will be covered through the grant.

PUBLICATIONS AND REPORTS

An annual report of activities will be submitted to the Restoration Office before 15 April of each year, commencing in 1998. Similar reports will also be presented to the Chignik Salmon Advisory Committee and the Alaska Board of Fish.

PROFESSIONAL CONFERENCES

American Fisheries Society, Anchorage. November 9-11, 1999. Paper of project was presented by Jim McCullough, ADF&G, Kodiak.

NORMAL AGENCY MANAGEMENT

This proposed rehabilitation effort is not part of ADF&G's normal management responsibilities in the Chignik area.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

This project is a continuation of Perryville 96-01, funded by DCRA funds from the EVOS Criminal Settlement (in State Fiscal Year 1996) and Trustee Council Civil projects 97247, 98247, 99247 and 00247 (in Federal Fiscal Years 1997, 1998, 1999 and 2000).

PRINCIPAL INVESTIGATORS

Jim McCullough, Fish Biologist III
Alaska Department of Fish and Game
Division of Commercial Fisheries and Management
211 Mission Road
Kodiak, Alaska 99615-6399
Phone: (907) 486-1813
Fax: 486-1841
E-mail: jim_mccullough@fishgame.state.ak.us

1 Nov 1995 - Present: FB III Regional Resource and Development Biologist. Co-author of the Pillar Creek and Kitoi Bay basic and annual hatchery plans. Voting member of the Kodiak, Chignik and Alaska Peninsula/Aleutian Islands Regional Planning Teams. Author/Review regional Fish Transport and Fish Resource Permits. Regional Habitat Biologist. Co-leader of an EVOS project to restore a coho stock for subsistence purposes in the Chignik Area.

30 June 1990 - 1 Nov 1995: FB III Alaska Peninsula Herring and Southeastern District Salmon Management Biologist. Compiled salmon and herring catch data and herring biomass and salmon escapement data which was analyzed to determine opening and closure of the various commercial fisheries as delegated by the Commissioner of ADF&G.

16 July 1985 - 31 May 1990: FB II Alaska Peninsula and Aleutian Islands Areas Finfish Research Biologist involved the design, organization, and completion of the annual catch and escapement program.

Lisa Scarbrough, Subsistence Resource Specialist II
Alaska Department of Fish and Game
Division of Subsistence
333 Raspberry Road
Anchorage, Alaska 99518-1599
Phone: (907) 267-2396
Fax: 267-2450
E-mail: lisa_scarbrough@fishgame.state.ak.us

Lisa Scarbrough has been a subsistence resource specialist with the Division of Subsistence of the Alaska Department of Fish and Game since 1989. She has extensive

subsistence research experience in the Chignik area, including the village of Perryville. This has included research on the effects of the oil spill on local subsistence patterns. Her work has also involved training residents of the Chignik area communities as research assistants. Since 1993, Lisa has been responsible for assessing Chignik Subsistence salmon permit data.

OTHER KEY PERSONNEL

Perryville Traditional Village Council
Gerald Kosbruk, President
Celia Yagie, Village Administrator
P.O. Box 101
Perryville, Alaska 99648
Phone: (907) 853-2203
Fax: 853-2230
Chief Community Coordinator- *Jerry Yagie* - Phone: (907) 853-2261

Bill Hauser, Fish Biologist IV
Alaska Department of Fish and Game
Division of Habitat and Restoration
333 Raspberry Road
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Wayne Dolezal, Habitat Biologist III
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George Pappas, Fish Biologist III
Chignik Area Management Biologist
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Chuck McCallum, Chairman
Chignik Regional Planning Team and Chignik Regional Aquaculture Association
(and Perryville Subsistence Workgroup)
614 Irving Street
Bellingham, Washington 98225
Phone: (360) 647-5540
Fax: 733-4744

Melvin Chya
Pillar Creek Hatchery
104 Center Avenue, Suite 202
Kodiak, AK 99615
Phone. (907) 486-6555

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Approved TC 8-3-00

Budget Category:	Authorized FY 2000	Proposed FY 2001	LONG RANGE FUNDING REQUIREMENTS					
Personnel	$2.9	$2.9						
Travel	$6.4	$6.4						
Contractual	$11.8	$11.8						
Commodities	$0.3	$0.3						
Equipment	$0.5	$0.0						
Subtotal	$21.9	$21.4				Estimated FY 2002		
General Administration	$1.3	$1.3						
Project Total	$23.2	$22.7				$30.0		
Full-time Equivalents (FTE)	0.5	0.5						
Other Resources								

Comments: An Environmental Assessment was approved in 1997. The final evaluation of the project is projected to be FY 2002.

This project was originally funded by Criminal Settlement funds in 1996. The budget estimate for 2001 is slightly less than projected amount stated on the 2000 DPD. We do not anticipate any equipment expenses this year, and money was not felt needed for inflation. We still intend for a Hatchery Specialist with the Kodiak Pillar Creek Hatchery to travel to Perryville for one trip to assist PI Jim McCullough and Perryville assistants with the November egg harvest and biological sampling. (Expenses are described under the contractual section). In 1998, this project funded the travel, wages and perdiem for two Perryville assistants to travel to Kodiak's Pillar Creek Hatchery for training in egg harvesting and biological sampling. Bringing the Hatchery Specialist to Perryville is less costly than sending Perryville assistants to Kodiak for updated training, and he will be able to evaluate the project and make recommendations, provide additional training to Perryville assistants and help with the egg harvest and biological sampling. In addition, One trip was added again this year for Jim McCullough to travel to Anchorage to attend the annual EVOS conference in January. Staff time (.5 months in 2001 and 2.0 months in 2002) is requested in order to develop and monitor the subcontract with Perryville and provide other staff support for the project, and write the final report in 2002.

FY01

Prepared:

Project Number: 01247
Project Title: Kametolook River Coho Salmon Subsistence Restoration
Agency: Alaska Department of Fish and Game

FORM 3A
TRUSTEE
AGENCY
SUMMARY

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2001
Lisa Scarbrough	Subsistence Resource Specialist II	16J	0.5	5.7		2.9
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		0.5	5.7	0.0	
					Personnel Total	$2.9

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2001
					0.0
*Kodiak to Anchorage	0.4	4	11	0.1	2.7
Anchorage to Perryville	0.8	3	13	0.1	3.7
					0.0
					0.0
* Note when traveling from Kodiak to Perryville it is necessary to overnight in Anchorage coming and going.					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$6.4

FY01

Prepared:

Project Number: 01247
Project Title: Kametolook River Coho Salmon Subsistence Restoration
Agency: Alaska Department of Fish and Game

FORM 3B
Personnel
& Travel
DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Contractual Costs:		Proposed
Description		FY 2001
4A Linkage	1) Contract with Native Village of Perryville (Perryville wages/ gasoline/ ATV or boat use/ insurance/ Village Admin. Fee (10%) 2) Contract with Kodiak Pillar Creek hatchery (wages for one employee for 6 days and travel and perdiem from Kodiak to Perryville) 3) Shipping costs of misc. maintenance supplies to Perryville, via USPS or Peninsula Airways.	11.8
When a non-trustee organization is used, the form 4A is required.	**Contractual Total**	$11.8

Commodities Costs:		Proposed
Description		FY 2001
General maintenance supplies for incubation boxes/ egg take equipment/ fish holding pens temperature instruments/ school aquarium/ film development etc.		0.3
	Commodities Total	$0.3

FY01

Prepared:

Project Number: 01247
Project Title: Kametolook River Coho Salmon Subsistence Restoration
Agency: Alaska Department of Fish and Game

FORM 3B
Contractual & Commodities DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2001
None expected in 2001			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency
None expected in 2001		

FY01

Project Number: 01247
Project Title: Kametolook River Coho Salmon Subsistence Restoration
Agency: Alaska Department of Fish and Game

FORM 3B
Equipment
DETAIL

Prepared:

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001	LONG RANGE FUNDING REQUIREMENTS					
Personnel	$6.2	$6.2						
Travel	$1.2	$1.2						
Contractual	$4.4	$4.4						
Commodities	$0.0	$0.0						
Equipment	$0.0	$0.0						
Subtotal	$11.8	$11.8				Estimated FY 2002		
Indirect								
Project Total	$11.8	$11.8						
Full-time Equivalents (FTE)	0.0	0.0						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

FY01

Prepared:

Project Number: 01247
Project Title: Kametolook River Coho Salmon Subsistence Restoration
Name: Perryville Village Council / Pillar Creek Hatchery

FORM 4A
Non-Trustee
SUMMARY

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:			Months	Monthly		Proposed
Name	Position Description		Budgeted	Costs	Overtime	FY 2001
						0.0
To be determined	Perryville					0.0
	Project Facilitator and assistants					5.4
						0.0
						0.0
Note: Appx. 54 days of work @ about $100.00/ day labor						0.0
						0.0
						0.0
To be determined	Pillar Creek Hatchery					0.8
	Hatchery Specialist					0.0
						0.0
Note: Appx. 6 days at $135.00/ day						0.0
	Subtotal		0.0	0.0	0.0	
					Personnel Total	$6.2

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2001
					0.0
(Pillar Creek hatchery)					0.0
*Kodiak to Anchorage	0.4	1	2		0.4
Anchorage to Perryville	0.8	1	5		0.8
					0.0
					0.0
* Note: Due to travel from Kodiak to Perryville, it is necessary					0.0
to overnight in Anchorage coming and going.					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.2

FY01

Prepared:

Project Number: 01247
Project Title: Kametolook River Coho Salmon Subsistence Restoration
Name: Perryville Village Council / Pillar Creek Hatchery

FORM 4B
Personnel
& Travel
DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Contractual Costs:	Proposed
Description	FY 2001
Perryville contract:	
Approximately 45 days of ATV use @ about $50.00/ day	2.3
Perryville's administrative fee at 10% of contract (not including insurance coverage)	0.8
Insurance for workman's compensation and general liability required of Perryville as contractor of the project by State of Alaska	1.3
Contractual Total	$4.4

Commodities Costs:	Proposed
Description	FY 2001
Commodities Total	$0.0

FY01

Project Number: 01247
Project Title: Kametolook River Coho Salmon Subsistence Restoration
Name: Perryville Village Council / Pillar Creek Hatchery

FORM 4B
Contractual & Commodities DETAIL

Prepared:

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

New Equipment Purchases:		Number	Unit	Proposed
Description		of Units	Price	FY 2001
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.			**New Equipment Total**	$0.0

Existing Equipment Usage:	Number	
Description	of Units	

FY01

Project Number: 01247
Project Title: Kametolook River Coho Salmon Subsistence Restoration
Name: Perryville Village Council / Pillar Creek Hatchery

FORM 4B
Equipment
DETAIL

Prepared:

01250

Approved TC 8-3-00

Project Management

Project Number:	01250
Restoration Category:	
Proposer:	All Trustee Council Agencies
Lead Trustee Agency:	ALL
Cooperating Agencies:	
Alaska SeaLife Center:	
New or Continued:	Cont'd
Duration:	
Cost FY 01:	
	$284.3
Cost FY 02:	
Geographic Area:	
Injured Resource/Service:	

ABSTRACT

Project management represents those costs incurred by the state and federal Trustee agencies in fulfilling their responsibility to ensure that individual projects are managed consistent with the Memorandum of Agreement and Consent Decree, the Restoration Plan, and Trustee Council authorization. Tasks performed by project managers include coordinating activities between principal investigators and the Restoration Office, reviewing project expenditure activity, assisting in the development of project proposals, and tracking project reports.

INTRODUCTION

The FY 01 proposal for project management reflects Trustee Council guidance to continue reductions in overall programmatic and administrative costs consistent with the reduced restoration program. In FY 00, the Trustee Council authorized a Work Plan budget of approximately $8.3 million inclusive of project management costs of $401,900. In FY 01, it is anticipated that the Trustee Council will approve a work plan budget of approximately $6 million inclusive of project management costs of $320,000. Future funding for project management will be assessed in light of Annual Work Plan needs but is anticipated to decline consistent with the reduction of overall Work Plan funding.

NEED FOR THE PROJECT

The project manager provides a link between the Restoration Office and the principal investigators. Project managers are to:

- Attend the annual Restoration Workshop;
- Attend Restoration Work Force meetings (roughly 4 a year);
- Ensure that projects are implemented consistent with the Trustee Council Procedures and/or state and federal procedures, including NEPA compliance;
- Monitor projects to ensure they meet their stated goals, objectives and schedules consistent with the funding authorized;
- Administer contracts that implement approved projects, including reviewing and approving invoices;
- Submit quarterly project reports to the Restoration Office, and ensure that annual and final reports and other contract deliverables are acceptable;
- Facilitate the printing/distribution of project reports to ARLIS; and
- Track the inventory of equipment purchased with Joint Trust Funds.

COMMUNITY INVOLVEMENT

Project managers for each project are available to the public to answer questions and provide information on the restoration projects they manage. Project managers also work with the Community Involvement Coordinator and Community Facilitators (see Project /052) as appropriate to address community involvement goals.

PROJECT DESIGN

A. Objectives

The role of the project manager is to ensure that projects funded by the Trustee Council are accomplished on time and consistent with the legal and regulatory requirements governing each project and Trustee Council procedures.

B. Methods

Project managers track project expenditures and status information and provide progress updates to the Restoration Office.

C. Cooperating Agencies, Contracts and other Agency Assistance

Organizational and administrative structures vary by agency. Certain projects have multiple agencies involved; others do not. Some projects involve contracts; others do not. In some cases, an agency's project management functions are accomplished in whole or in part by the agency liaison funded through the Project 01100/Restoration Work Force budget. In other cases, project management funds are provided in addition to liaison funding to support the management of numerous or complex projects.

SCHEDULE

A. Measurable Project Tasks for FY 01 (October 1, 2000 - September 30, 2001)

October 10-12:	Attend Annual Workshop
October 31:	Submit prior year fourth quarter expenditure and project status information to the Restoration Office.
December 31:	Submit updated inventory of equipment purchased with Joint Trust Funds to the Restoration Office.
January 31:	Submit first quarter expenditure and project status information to the Restoration Office.
April 15:	Submit Detailed Project Descriptions and detailed budgets for FY 2002 proposals to the Restoration Office.
April 30:	Submit second quarter expenditure and project status information to the Restoration Office.
July 31:	Submit third quarter expenditure and project status information to the Restoration Office.

B. Project Milestones and Endpoints

Not applicable to this project.

C. Completion Date

Funding for project management will likely be provided each year in which restoration projects are funded. Once the transition is made in FY 02 to funding through the Restoration Reserve, the need for project management funds will be reassessed.

PUBLICATIONS AND REPORTS

The project manager's role is to ensure timely completion of annual and/or final projects reports. They do not prepare reports themselves.

PROFESSIONAL CONFERENCES

All project managers are required to attend the Annual Restoration Workshop.

NORMAL AGENCY MANAGEMENT

The project managers perform tasks specific to the *Exxon Valdez* oil spill restoration program that are not part of normal agency management.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Project managers facilitate communication among projects as well as between researchers and the Restoration Office.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

Not applicable to this project.

PROPOSED PRINCIPAL INVESTIGATOR, IF KNOWN

Not applicable to this project.

This version to RLF
Approved TC 3-00

2001 EXXON VALDEZ TRU : COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Agency Req FY 01	ED Rec FY 2001	ED REC FY 01 AGENCY TOTALS					
				ADEC	ADF&G	ADNR	USFS	DOI	NOAA
				$19.1	$92.2	$17.0	12.2	$50.6	$93.2
Personnel	$349.5	$306.4	$247.2						
Travel	$0.0	$0.0	$0.0						
Contractual	$0.0	$0.0	$0.0						
Commodities	$0.0	$0.0	$0.0						
Equipment	$0.0	$0.0	$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$349.5	$306.4	$247.2						
General Administration	$52.4	$46.0	$37.1						
Project Total	$401.9	$352.4	$284.3						
Full-time Equivalents (FTE)	4.5	0.0	0.0						

Comments:

2001

Prepared:7/19/00

Project Number: 01250
Project Title: Project Management
Lead Agency: All

FORM 2A
MULTI-TRUSTEE
AGENCY
SUMMARY

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Agency Req. FY 01	ED Rec FY 2001
Personnel	$24.3	$41.5	$16.6
Travel			
Contractual			
Commodities			
Equipment			
Subtotal	$24.3	$41.5	$16.6
General Administration	$3.6	$6.2	$2.5
Project Total	$27.9	$47.7	$19.1
Full-time Equivalents (FTE)	0.3		

LONG RANGE FUNDING REQUIREMENTS

		FY 1999	FY 2000	ED Rec FY 2001				
Personnel Costs:		Months	Months	GS/Range/	Months	Monthly		Proposed
Name	Position Description	Budgeted	Budgeted	Step	Budgeted	Costs	Overtime	FY 2001
Marianne See		2.0	3.0	26E	2.0	8.3		0.0 16.6 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
	Subtotal	2.0	3.0		2.0	8.3	0.0	$16.6

2001

Project Number: 01250
Project Title: Project Management
Agency: Alaska Department of Environmental Conservation

FORM 3A
PROJECT
MANAGEMENT

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Agency Req FY 01	ED Rec FY 2001
Personnel	$134.7	$80.2	$80.2
Travel			
Contractual			
Commodities			
Equipment			
Subtotal	$134.7	$80.2	$80.2
General Administration	$20.2	$12.0	$12.0
Project Total	$154.9	$92.2	$92.2
Full-time Equivalents (FTE)	1.7		

LONG RANGE FUNDING REQUIREMENTS

		FY 1999	FY 2000	ED Rec FY 2001				
Personnel Costs:		Months	Months	GS/Range/	Months	Monthly		Proposed
Name	Position Description	Budgeted	Budgeted	Step	Budgeted	Costs	Overtime	FY 2001
								0.0
W. Hauser	Project Manager	12.0	9.0	20M	6.5	7.5		48.8
C. Slater	Liaison	0.0	1.0	20J	1.0	6.8		6.8
M. Kuwada	Project Manager	12.0	5.0		0.0	0.0		0.0
C. Rozen	Librarian	7.0	5.0	17K	4.0	6.1		24.4
						Rounding adjustment		0.2
								0.0
								0.0
								0.0
								0.0
	Subtotal	31.0	20.0		11.5	20.4	0.0	$80.2

2001

Prepared: 7/27/99

Project Number: 01250
Project Title: Project Management
Agency: Alaska Department of Fish and Game

FORM 3A
PROJECT
MANAGEMENT

2001 EXXON VALDEZ TRU[illegible] COUNCIL PROJECT BUDGET

October 1, 200[illegible] September 30, 2001

Budget Category:	Authorized FY 2000	Agency Req FY 01	ED Rec FY 2001
Personnel	$22.2	$14.8	$14.8
Travel			
Contractual			
Commodities			
Equipment			
Subtotal	$22.2	$14.8	$14.8
General Administration	$3.3	$2.2	$2.2
Project Total	$25.5	$17.0	$17.0
Full-time Equivalents (FTE)	0.3		

LONG RANGE FUNDING REQUIREMENTS					

Personnel Costs:		FY 1999 Months	FY 2000 Months	ED Rec FY 2001 GS/Range/	Months	Monthly		Proposed
Name	Position Description	Budgeted	Budgeted	Step	Budgeted	Costs	Overtime	FY 2001
								0.0
TBD	Natural Res. Manager II	3.0	3.0	20	2.0	7.4		14.8
								0.0
								0.0
								0.0
								0.0
								0.0
								0.0
								0.0
								0.0
	Subtotal	3.0	3.0		2.0	7.4	0.0	$14.8

2001

Project Number: 01250
Project Title: Project Management
Agency: Alaska Department of Natural Resources

FORM 3A
PROJECT
MANAGEMENT

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Agency Req FY 01	ED Rec FY 2001
Personnel	$18.6	$15.9	$10.6
Travel			
Contractual			
Commodities			
Equipment			
Subtotal	$18.6	$15.9	$10.6
General Administration	$2.8	$2.4	$1.6
Project Total	$21.4	$18.3	$12.2
Full-time Equivalents (FTE)	0.3		

LONG RANGE FUNDING REQUIREMENTS

Personnel Costs:		FY 1999 Months	FY 2000 Months	ED Rec FY 2001				
Name	Position Description	Budgeted	Budgeted	GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	Proposed FY 2001
								0.0
								0.0
McElmurry	Program Manager	3.0	3.0	GS-11	2.0	5.3		10.6
								0.0
								0.0
								0.0
								0.0
								0.0
								0.0
	Subtotal	3.0	3.0		2.0	5.3	0.0	$10.6

2001

Project Number: 01250
Project Title: Project Management
Agency: United States Forest Service

FORM 3A
PROJECT
MANAGEMENT

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Agency Req FY 01	ED Rec FY 2001
Personnel	$61.0	$51.0	$44.0
Travel			
Contractual			
Commodities			
Equipment			
Subtotal	$61.0	$51.0	$44.0
General Administration	$9.2	$7.7	$6.6
Project Total	$70.2	$58.7	$50.6
Full-time Equivalents (FTE)	0.8		

LONG RANGE FUNDING REQUIREMENTS

		FY 1999	FY 2000	ED Rec FY 2001				
Personnel Costs:		Months	Months	GS/Range/	Months	Monthly		Proposed
Name	Position Description	Budgeted	Budgeted	Step	Budgeted	Costs	Overtime	FY 2001
								0.0
D. Irons	Project Manager - FWS	4.0	4.0	GS-12	2.0	7.0		14.0
D. Bohn	Project Manager - USGS	7.0	6.0	GS-12	5.0	6.0		30.0
								0.0
								0.0
								0.0
								0.0
								0.0
								0.0
								0.0
	Subtotal	11.0	10.0		7.0	13.0	0.0	$44.0

2001

Project Number: 01250
Project Title: Project Management
Agency: United States Department of the Interior

FORM 3A
PROJECT
MANAGEMENT

2001 EXXON VALDEZ TRU[illegible] COUNCIL PROJECT BUDGET

October 1, 200[illegible] - September 30, 2001

Budget Category:	Authorized FY 2000	Agency Req FY 01	ED Rec FY 2001
Personnel	$88.7	$103.0	$81.0
Travel			
Contractual			
Commodities			
Equipment			
Subtotal	$88.7	$103.0	$81.0
General Administration	$13.3	$15.5	$12.2
Project Total	$102.0	$118.5	$93.2
Full-time Equivalents (FTE)	1.1		

LONG RANGE FUNDING REQUIREMENTS

Personnel Costs:		FY 1999 Months	FY 2000 Months	ED Rec FY 2001 GS/Range/	Months	Monthly		Proposed
Name	Position Description	Budgeted	Budgeted	Step	Budgeted	Costs	Overtime	FY 2001
								0.0
								0.0
B. Wright	Project Manager	6.0	10.0	GS-13	9.0	8.5		76.5
								0.0
								0.0
								0.0
TBD	Fisheries Biologist	8.0	5.0	GS- 9	1.0	4.5		4.5
								0.0
								0.0
								0.0
	Subtotal	14.0	15.0		10.0	13.0	0.0	$81.0

2001

Project Number: 01250
Project Title: Project Management
Agency: National Oceanic and Atmospheric Administration

FORM 3A
PROJECT
MANAGEMENT

Revised 7-10-00
Approved TC 8-3-00

Sockeye Salmon Stocking at Solf Lake

Project number:	01256B
Restoration Category:	Subsistence
Proposer:	USFS
Lead Trustee Agency:	USFS
Cooperating Agencies:	ADF&G
Alaska Sea Life Center:	No
Duration:	6th year, 7-year project
Cost FY 2000:	$159.5
Cost FY 2001:	$24.4
Cost FY 2002:	$20.0
Cost FY 2003:	$5.0
Cost FY 2004:	
Geographic Area:	Prince William Sound
Injured Resource:	Subsistence/Sockeye Salmon

ABSTRACT

This project is designed to benefit subsistence users of Western Prince William Sound. Solf Lake has been recognized for many years as an opportunity to establish a self-sustaining sockeye salmon run. Habitat improvements were made in 1978, 1980 and 1981 to provide access to the lake for anadromous fish. The lake was never stocked and subsequent investigations suggested that it was fishless. There are two phases to this project: Phase 1, which began in FY96, has verified the ability of Solf Lake to support a sustainable population of sockeye salmon. Phase 2, included stocking the lake with approximately 100,000 sockeye salmon fry, then ensuring access to Solf Lake for returning adult salmon. The stocking program began in 1997 and outlet flow control structures were completed in 1997 and 1998. The reconstruction of the fishway in the eastern channel will be completed in the summer of 2000 ensuring returning adult salmon access to Solf Lake in the year 2001.

INTRODUCTION

Subsistence use of resources in the oil spill area declined following the spill. Although restoration studies have shown that harvest levels have since returned to pre-spill levels in most oil spill communities, Chenega Bay and Tatitlek are exceptions (Seitz and Fall, 1995; Seitz and Miraglia, 1995). These communities showed reduced harvest levels in 1993/94 and an increased reliance on salmon harvests (Seitz and Fall, 1995; Seitz and Miraglia, 1995). Solf Lake provides an opportunity to establish a large replacement fishery that is easily accessible, approximately 40 miles from Chenega Bay.

This proposal is a request for continued support from the Trustee Council to fund the sixth year of a seven-year project to restore sockeye salmon (*Oncorhynchus, nerka*) runs to Solf Lake. Construction on water control structures at the two outlets of Solf Lake is complete and the stocking and rearing of sockeye salmon fry is underway. Reconstruction of the fishway to ensure access to Solf Lake for returning adult salmon will be completed in the summer of 2000.

Two additional years of stocking and monitoring are required to establish a run of sockeye salmon and evaluate the performance of the structural improvements. Approval of this proposal would provide the necessary funding to evaluate improvements, stock Solf Lake for an additional year and collect information on returning adults. The first returns from the 1998 stocking are expected in May and June of 2001, at that time the fishway should be evaluated for fish passage effectiveness and spawning habitat utilization by returning fish.

Solf Lake has been recognized as an opportunity to reestablish a sockeye salmon run in Prince William Sound for many years. According to Nickerson (1978), "This system had historic runs of sockeye salmon. An earthquake in the 1930's caused blockages of the natural outlet resulting in water flowing over an impassable fall." Starting in the early 1970's, various attempts have been made to reestablish sockeye salmon in Solf Lake. For two years in this same period, ADF&G personnel transported adult sockeye salmon from Eshamy River to Solf Lake (Jackson, personal communication). Unfortunately, necessary stream improvements had not been completed when the offspring from the transplanted fish returned. In 1978, 1980 and 1981, the USFS implemented improvements to the lake and outlet stream. The work consisted of improving the eastern outlet and partially damming the western outlet. The dam was designed to raise the level of the lake to provide adequate water flow for fish passage at the eastern outlet. The improved eastern outlet channel is less than 100 meters in length, with an average gradient of 23 percent, see (Figure #2 in Appendix) for site details. Stocking of Solf Lake never occurred because of other priority projects for both the USFS and ADF&G, and the outlet improvements fell into disrepair.

ADF&G surveyed Solf Lake in 1985/1986 as part of a lake investigation study. The results of this survey, which included attempts to capture fish, suggest that the lake may be fishless (Pellissier and Somerville, 1987). However 1996 minnow trapping by USFS crews indicated a larger population of Dolly Varden (*Salvelinus malma*) than has been previously observed, but still not significant. These results are also supported by the composition and biomass of the

zooplankton populations, which were sampled in 1986 (P. Shields, personal communication 1996). The Pellissier and Somerville (1987) survey also documented three minor barriers to fish passage in the eastern channel.

ADF&G recommends stocking levels based on their zooplankton studies. ADF&G will also take a conservative approach to stocking because barren lakes often have unstable macrozooplankton communities when faced with predation. With close evaluation, and by experimenting with stocking strategies, significant impacts to the macrozooplankton community will be ameliorated. Major reasons for the disparity of response to stocking barren lakes include 1) the inherent low productivity of these lakes; 2) macro zooplankton abundance, composition, and ability to adapt to predation; 3) stocking density; 4) morphometric factors and 5) variability in the indirect effects of predation in individual lakes. While Solf Lake is most likely capable of supporting stocking at the 500,000 fry level, it has been decided to take a more conservative approach to stocking. Based on available spawning habitat and the RPT's (Regional Planning Team) recommendations a target of 100,000 sockeye fry will be stocked into Solf Lake on an annual basis.

Solf Lake is a clear water lake with a mean depth of 42.5 m and a surface area of approximately 0.61 km^2 (Barto and Nelson, 1982). Based on historical limnological data from the 1980's, stream survey data collected in 1996, and analysis of current limnological data it is reasonable to expect that the lake is capable of supporting a sustainable sockeye population. Based on the available spawning area, it is estimated that Solf Lake could sustain a run of approximately 10,000 sockeye salmon. An escapement goal of approximately 4,500 fish would be required to fully seed the system without depleting the zooplankton populations, leaving 5,500 sockeye available for harvest. Consequently, we are recommending stocking at the 100,000 fry level to meet the objective of the stated return and the assumption that there will be a high fry to adult survival.

With the exception of 1986 prior to stocking activity, Diaptomus have accounted for more than 50% of the total biomass followed by Cyclops, which generally comprises about 30 % of the total. The remainder of the total macrozooplankton (TMZ) consisted primarily of the cladoceran form Bosmina and very small numbers of Daphnia. Diet selectivity studies for rearing sockeye fry have shown that fry presented with a wide choice of food items tend to select for cladoceran and large calanoid forms. Although sockeye fry do graze on Cyclops, it is not actively selected. Thus, In Solf Lake, we would expect the large, red pigmented, and therefore, highly visible Diaptomus, to be an indicator species of excessive grazing pressure and a guide to gauge stocking levels.

The 1999 stocking level of approximately 100,000, .5 gm., sockeye fry did appear to have an influence on (TMZ) and the abundance of Bosmina, indicated by a 81% decline in density and a 84% decline in biomass from pre-stocking means. Diaptomus declined similarly by 43% in density and 45% in biomass however these levels fall within the range of pre-stocking observations. The decline in Cyclops 66% and 69% respectively also fall within annual fluctuations and is probably not due to grazing, it is doubtful we would see a decline in this species before the highly preferred types, Figures #3 & #4 in Appendix. In February ADF&G and Forest Service biologist and Project Investigators reviewed the macrozooplankton results and

determined that current stocking levels are still supported at Solf Lake and that the observed decline in macrozooplankton is within expected parameters.

Personnel from the Main Bay Hatchery successfully collected green eggs from Coghill brood stock and reared them at their Main Bay facility. Overall, survival of green eggs to released fry was approximately 90%. This resulted in the release of approximately 100,000, 0.50-gram fry into Solf Lake in the spring of 1999. A percentage of fry released were marked with half-length coded wire tags. PWSAC changed their Area Management Plan in 1999 to allow only Coghill brood stock at Main Bay Facility for future stocking activities; this resulted in a change to the stock used at Solf Lake. Discussions with the State Geneticist and the RPT have indicated that since the return at Solf is expected to be small the stock switch presents no concerns.

On 2 May 1999 the smolt enumeration box was installed in the flow control structure (northeast outlet) to capture all migrating smolts at Solf Lake. Later a fine mesh net was placed across the northwest dam to block smolt passage, forcing all emigrating smolts through the counting live-box at the NE outlet. The live-box was monitored periodically to avoid crowding and smolt mortality. On 17 June the counting box was replaced with an inclined-plane trap (Todd 1994) and fished for the remaining duration of the project, until 26 July. No smolts were caught in May. The first smolts were caught on 5 June, and the peak count occurred on 6 June when 189 smolt were enumerated. The 1999 total count was 248 sockeye salmon smolt and 45 Dolly Varden. The mean size of sampled (N=16) sockeye salmon smolt was 134.7 mm and 22.9 g. On the night of 27 September 1999 a hydroacoustic and tow-net survey were conducted on Solf Lake. There were essentially no targets (fish) recorded for the whole survey, 12 transects perpendicular to the longitudinal axis of the lake. Two tows were conducted at different depths using a 2 x 3 m tow-net and no fish were captured.

Because of the large sizes of sampled smolt and small number (248) counted during the spring emigration in 1999, and the lack of fish targets during the fall hydroacoustic survey, it is believed that the majority of fry stocked in both 1998 and 1999 emigrated as age-0 smolt during late summer. Cook Inlet Aquaculture Association (CIAA) has documented age-0 sockeye salmon smolts emigrating from their lake stocking programs; from 1990-1995, estimates of age-0 smolt emigrating Chelatna Lake (Susitna River basin) have ranged from less than 1% to 62% of the total outmigration (Fandrei 1995), and in Bear Lake (Seward) age-0 smolt estimates for 1990-1994 have ranged from less than 1%, up to 98% in one year (Hetrick and Prochazka 1998). At this time it is uncertain what the effects of this early emigration will have on ocean survival and consequently the number of returning adults to Solf Lake. This early outmigration is expected to discontinue as the available zooplankton is reduced and fry growth rates decrease and stabilize.

The eastern outlet to the lake required reconstruction of the "irrigation type" control dam; this work was completed in 1997. During the 1998 field season Forest Service personnel completed the installation of the diversion weir structure at the lakes western outlet, EVOS Project 98256b. The fishway in the eastern outlet will be completed in the summer of 2000 and is designed to provide sockeye salmon passage into Solf Lake. The design calls for two Alaska Steepasses one 30 feet, another 40 feet. in length installed at a 22% slope. Each steepass will require a concrete

head wall and footers. The upper pass will spill into an excavated section of bedrock lined with concrete to form a watertight trench. Additionally five step pools will be created by the installation of five notched concrete weirs, to facilitate fish passage.

NEED FOR THE PROJECT

A. Statement of Problem

Subsistence use of resources in the oil spill area declined following the spill. Although restoration studies have shown that harvest levels have since returned to pre-spill levels in most oil spill communities, Chenega Bay and Tatitlek are exceptions (Seitz and Fall, 1995; Seitz and Miraglia, 1995). These communities showed reduced harvest levels in 1993/94 and an increased reliance on salmon harvests (Seitz and Fall, 1995; Seitz and Miraglia, 1995). Solf Lake provides an opportunity to establish a large replacement fishery that is easily accessible for subsistence users from Chenega Bay. Projects available for the restoration or replacement of lost subsistence services are limited; this proposal would use one of the few opportunities available.

This project has determined the feasibility of stocking Solf Lake with sockeye salmon and proposes the steps required to establish a replacement fishery for subsistence use. Based on historical limnological data from the 1980's and current observations, along with stream survey data collected in 1996 it is reasonable to expect that the lake is capable of supporting a sustainable sockeye population with an adult return of approximately 10,000 fish.

B. Rationale/Link to Restoration

The *Exxon Valdez* Restoration Office's Invitation to submit proposals for FY97 stated that subsistence users are traveling greater distances and must invest more time in subsistence harvesting than they did before the spill. Unlike many other oil spill communities, Chenega Bay still shows reduced subsistence harvest levels and a greater reliance on subsistence harvest of salmon (Seitz and Fall, 1995; Seitz and Miraglia, 1995). Solf Lake is located approximately 40 miles from Chenega Bay and provides an opportunity to establish a replacement fishery that is accessible to subsistence users. The lake is a clear water lake with a mean depth of 42.5 m and a surface area of approximately 0.61 km^2 (Barto and Nelson, 1982). Analyses of current data suggest that the lake may support a self-sustaining population of 10,000 sockeye with roughly half being available for harvest. Establishing this fishery would provide food for the tables of subsistence users in Western Prince William Sound.

Cost benefit calculation for subsistence resources are difficult to place a monetary value on give that the nature of these resources are more intrinsic and cultural. This project will provide a subsistence resource to local communities in perpetuity.

If this project were to be evaluated as a commercial enhancement activity the resultant harvest would be approximately 4,500 fish/yr. This would result in an annual harvest of 27,000 lb. of sockeye salmon. Assuming an ex-vessel price of $1.75/lb. and a 2.5 multiplier to adjust for retail

value providing a $118,125 /yr. cash benefit. This information is provided purely to demonstrate a cash benefit to substance users whoever does not capture the intrinsic and cultural values this project will provide.

C. Location

Solf Lake is located off Herring Bay on Knight Island. The lake is approximately 40 miles by boat from Chenega Bay and 46 miles from Whittier. The lake is unnamed on USGS maps; however, Nickerson (1978), PWSRPT (1983 and 1986), Barto and Nelson (1982) all refer to the lake as Solf Lake (ADF&G Stream 690). The lake is described in the Anadromous Waters Catalog as number 226-10-16900-0010 (ADF&G, 1992). See location map, (Figure #1 in Appendix).

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

This project is designed specifically to benefit subsistence users of PWS; therefore, community involvement is an important component for the success of the project. The feasibility phase of this project (FY96) has determined the ability of Solf Lake to support a self-sustaining population of sockeye salmon. Contacts with the Chenega Bay community liaison will be maintained throughout the feasibility and implementation phases of this project to discuss what the potential production might be for the lake, and project schedules. Opportunities will be identified to include residents of Chenega Bay in habitat improvement work or in the post-stocking monitoring program.

PROJECT DESIGN

A. Objectives

All of the objectives described in Phase 1 will be completed in FY99. The phase 2 objectives will continue to be addressed in FY00.

Phase 1. The overall objective of this phase of the project was to determine the feasibility of stocking Solf Lake with sockeye salmon. There are four components to this objective:

1. Determine if Solf Lake can sustain a population of sockeye salmon; (completed).
2. Determine appropriate stocking levels; (completed).
3. Coordinate with PWSAC and Main Bay hatchery to establish an appropriate brood stock and the necessary logistics to begin a stocking program; (completed).
4. Evaluate the existing habitat improvement structures to ensure adequate conditions for adult migration; (to be completed in FY99).

Phase 2. This is the implementation phase of the project it has three components.

1. Design and construct necessary improvements to the outlet channel and dam to ensure adequate passage for adult salmon migration; (75% complete).
2. Stock Solf Lake with sockeye salmon to produce a self-sustaining population that can provide an adequate subsistence harvest; (ongoing).
3. Monitor zooplankton and out-migration to ensure appropriate stocking levels; (discontinued).

B. Methods

Project 96256 included one season of data collection to determine presence of resident fish and the potential carrying capacity of Solf Lake. Information collected in 1999 will identify the habitat improvements needed to establish a sustainable sockeye run and allow for the design of the fishway. The following section is divided into two parts. Part 1 describes the methods needed to establish a self-sustaining sockeye salmon population. Part 2 describes the steps that may be needed to provide access for returning adult salmon.

Part 1. This section outlines the methods to implement a stocking program at Solf Lake.

Interagency Coordination: Close coordination between the USFS, ADF&G, PWSAC and the PWS/CR RPT is mandatory for the success of this project. Prince William Sound is a complex ecosystem and the potential stocking of Solf Lake needs to be considered in perspective with the overall management of the Sound. Interagency coordination started in 1996 and continues through 2000 to identify appropriate brood stocks, determine appropriate stocking levels, meet hatchery-related requirements, and to address mixed-stock fisheries issues.

Stocking Program (1998 to 2002): Appropriate stocking levels and strategies have been determined in coordination with ADF&G and PWSAC using all available data. Fry are currently being short-term reared at the Main Bay Hatchery and transported to the lake for release. The Eyak and Coghill stocks are identified in the PWS/CR Phase 3 Comprehensive Salmon Plan (PWS/CR RPT, 1994) as potential stocks for Solf Lake. At least four years of fry transplants would be required to establish a sockeye salmon run.

On the recommendation of the RPT, Eyak fish were selected as the brood stock for the Solf Lake project. At that time, there was concern that the incubation temperatures were too high in Solf Lake for early run Eyak fish. However, an early run stock was chosen to minimize management conflicts. Since that time, PWSAC has updated their Area Management Plan, which includes discontinuing the rearing of all sockeye stocks except Coghill fish at their Main Bay facility. On February 18th, 1999 a letter was sent to the RPT indicating that the Forest Service had no objection to switching the stock to Coghill fish, since these fish are also identified in the PWS/CR Phase 3 Comprehensive Salmon Plan as a suitable stock for Solf Lake. The mid run timing of the Coghill fish may additionally provide a more favorable incubation period than the Eyak stock, increasing the likelihood of a successful project. Discussions with the State

Geneticist and the RPT have indicated that since the return at Solf is expected to be small and isolated from other stocks the stock switch presents no concerns.

Monitoring (1998 to 2000): Limnological data will be collected through 2000 of the stocking program to evaluate the affect of the stocking program on the plankton population. This monitoring will include a summer and fall sampling period for water chemistry analysis and monthly zooplankton sampling from May through September. These procedures are described in detail in Koenings et. al. (1987). This would be a reduced sampling design from the one used during the feasibility assessment of the lake.

The success of the stocking program would also be monitored through sampling the fish population during the smolt out-migration and during adult escapement. Smolt will be collected by weir to estimate the total out-migration. Fish will be sampled to determine age, length and weight characteristics that can be used to evaluate the health of the population. Coded wire tags will be used to monitor the adult population. Additionally hydroacoustic and tow-net surveys will be conducted on Solf Lake at approximately 12 transects perpendicular to the longitudinal axis of the lake to enumerate fry abundance. Returning adults will be enumerated at a weir on the outlet stream and if possible with aerial surveys. Scales will also be collected and the age structure of the returning fish will be analyzed.

Part 2. This section recognizes the work that has been needed to provide access to the lake for returning adults. Construction of the fishway at the eastern channel in 2000 should ensure salmon have access to Solf Lake, however returning adults should be monitored closely to determine the success of the improvements.

Outlet Flow Control Structures (1997 – 1998): The existing improvement structures at the two outlets of the lake were evaluated. It was determined that the old structure, which dams the impassable western outlet, required extensive reconstruction to provide adequate flow for fish passage at the lakes eastern outlet. The eastern outlet, that would provide fish access to the lake also required reconstruction of the "irrigation type" control dam, this work was completed in 1997. An engineered survey of the western outlet and suitable dam design were completed in 1997 and in 1998, installation of the new diversion dam at the western outlet was completed.

Channel Modifications (2000): Solf Lake was visited by ADF&G personnel as part of a PWS lake investigation project in 1985 (Pellissier and Somerville, 1987). Three minor barriers to fish migration were identified in the outlet channel. These barriers were velocity barriers that ranged in size from 1.5 to 2.5 meters. The barriers may potentially be removed through the creation of plunge pools or by installing steeppasses. The report also suggested that the barriers might not exist if more water were in the outlet channel, which could be achieved by repairing or rebuilding the dam at the waterfall of the original outlet channel.

An engineered survey of the stream channel and hydraulic analysis reveled improvement were necessary to ensure fish passage into Solf Lake. The approved design will provide sockeye

salmon moderately difficult passage into Solf Lake during anticipated low flow periods of 10 cfs., at any tide stage. The design calls for two Alaska Steepasses one 30 feet, another 40 feet. in length installed at a 22% slope. Each steepass will require a concrete head wall and footers. The upper pass will spill into an excavated section of bedrock lined with concrete to form a watertight trench. Additionally five notched concrete weirs; to facilitate fish passage during periods of low stream flow will also be installed. Construction should be completed by mid summer of 2000 and evaluation of returning fish passage in 2001 will determine success. Figure #5 in Appendix.

C. Cooperating Agencies, Contracts, and Other Agency Assistance

USFS will conduct the habitat surveys, evaluations of the habitat improvement structures, determine available spawning and rearing habitats, evaluate fish populations and construct improvements. Coordination will occur with PWSAC to make any necessary adjustments at the Main Bay Hatchery to accommodate additional incubation and short-term rearing. Coordination will also occur with PWSAC to perform any necessary fish culture work and transport the fry to the lake. Interagency coordination is essential to establish a successful population at Solf Lake. The PWS/CR RPT will be involved in assessing opportunities and for developing strategies for the stocking program. ADF&G, Residents of Chenega and the USFS will coordinate and develop a harvest strategy prior to sockeye returning to Solf Lake to prevent possible over escapements.

SCHEDULE

A. Measurable Project Tasks for FY01

Oct - June:	PWSAC. Rear sockeye fry at Main Bay.
Oct:	Attend Annual Restoration Workshop.
Jan - April:	USFS. Prepare for field season award contracts for logistics.
Jan - April:	USFS. Prepare and submit Annual Report and updated DPD.
June:	PWSAC. Release fourth year of sockeye fry at Solf Lake.
April - July:	USFS. Evaluate fishway and monitor returning adult salmon.
Oct - April:	ADF&G. Prepare report, attend annual workshop.
Aug:	PWSAC. Conduct egg takes for 2002 stocking at Solf Lake.

B. Project Milestones and Endpoints

Phase 1. The overall objective of this stage of the project was to determine the feasibility of stocking Solf Lake with sockeye salmon. This objective has been completed and mixed-stock fisheries and genetic risk issues are resolved.

Phase 2. This is the actual stocking phase of the project. With the completion of Phase 1 and a favorable recommendation from the RPT stocking began in FY98 and is on schedule for FY99. The evaluation of the eastern channel at Solf Lake indicates that additional work is needed to allow for adequate fish passage. These improvements would have to be made before adult fish return to the lake in the year 2001. The following is a tentative schedule and measurable end points that apply to the two phases of this project.

Oct - Dec. FY97:	Determine appropriate brood stock and potential stocking levels. Coordinate with PWSAC and the PWS RPT for production planning.
Jan-April FY98:	Apply for necessary permits and hatchery space; complete NEPA process.
May-July FY99:	Survey and design of improvements for eastern channel.
April-July FY00:	Construct fishway in eastern channel, monitor for returning jack salmon.
June-July FY97-01:	Collect eggs for brood stock.
FY98 - FY02:	Release hatchery-reared fry Submit annual reports
FY01 - FY03:	Enumerate adult returns and evaluate fishway. Prepare and submit final report.

C. Completion Date

The final report will be prepared and submitted by April 15th 2003.

PUBLICATIONS AND REPORTS

Annual reports and an updated DPD will be submitted during each year of the project. A final report will be submitted in FY03.

PROFESSIONAL CONFERENCES

At this time, there are no plans to present this project at professional conferences however, a poster display for educational and informational purposes is planned.

NORMAL AGENCY MANAGEMENT

Given current agency priorities the opportunity to conduct this project under normal agency management either now or in the near future is unlikely. However, some aspects of the long-term maintenance and monitoring of the project, may fall under the normal agency management.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Initial coordination with ADF&G biologists in Cordova, with the Regional Planning Team, and with PWSAC will continue throughout FY99 to address the mixed-stock fisheries and genetic risk issues that will influence the feasibility of this project. USFS Personnel attend the 1996 summer Regional Planning Team meeting to initialize the necessary coordination. The results from FY96 were presented to the RPT outlining, potential size of the stocking program and brood stocks. The information was used to assess the potential effects of this project on local wild stocks and on the commercial fisheries in the area.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

This proposal covers only one of the two locations described in the original proposal 96256. The proposal for the other site, Columbia Lake, was resubmitted as 97256a. The feasibility study of Columbia Lake determined that it would not be a good candidate for stocking at this time and has since been dropped from further study.

We proposed in the FY99 DPD to move back the implementation of the fishway construction until FY00, this modification has been approved by the Trustee Council. Close inspection of the eastern channel revealed subterranean flows and a great deal of rubble within the channel. These factors have required a much more detailed survey and an experienced Fisheries Engineer to develop a design that will function properly in this complex channel.

PROPOSED PRINCIPAL INVESTIGATOR

Dan Gillikin
Glacier Ranger District
P.O. Box 129
Girdwood, AK. 99587
(907) 783-3242

Gary Todd
Limnology Laboratory (ADF&G)
3428 Kalifornsky Beach Rd. #8
Soldotna, AK 99669
(907) 262-9368

PRINCIPAL INVESTIGATOR

The principal investigator of this project will Daniel Gillikin, Fisheries Biological Technician; Glacier Ranger District. Dan is the logistics and construction specialist for the fisheries department at Glacier and will coordinate this project for the USFS. Currently Dan holds the position of Fisheries Technician on the Glacier District. Dan has twelve years of experience as a fisheries technician with Private and Federal Agencies in Washington and Alaska. He would work with the project manager and conduct project implementation, environmental compliance, agency coordination, budget management and reporting.

ADF&G is the cooperating agency on the project. Gary Todd, Fishery Biologist I, will be the principal investigator for the limnological and bathymetry work.

OTHER KEY PERSONNEL

Cliff Fox, U.S. Forest Service Glacier Ranger District Chugach National Forest. Currently holds the position of Resource Staff Officer on the Glacier District. Cliff has 20 years experience in natural resource management with State and Federal Agencies in California, Idaho and Alaska.

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PERSONAL COMMUNICATIONS

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Shields, P., Fish Biologist I, Alaska Department of Fish and Game. Division of Commercial Fish Management and Development. Soldotna Limnology Lab. April 1996.

APPENDIX

Figure # 1. Solf Lake Location Map.

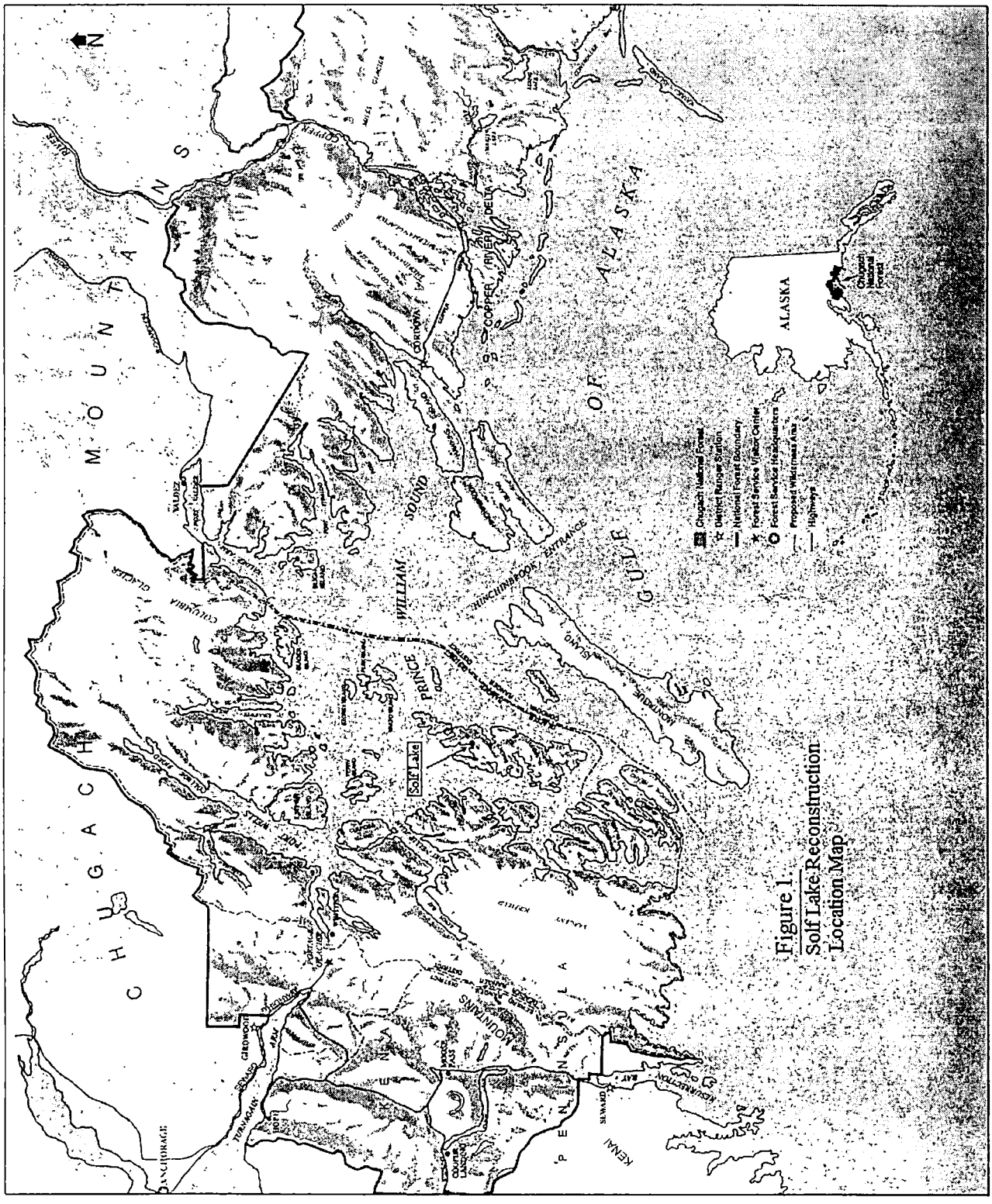


Figure 1.
Solf Lake Reconstruction
Location Map

Figure # 2. Solf Lake Site Plan

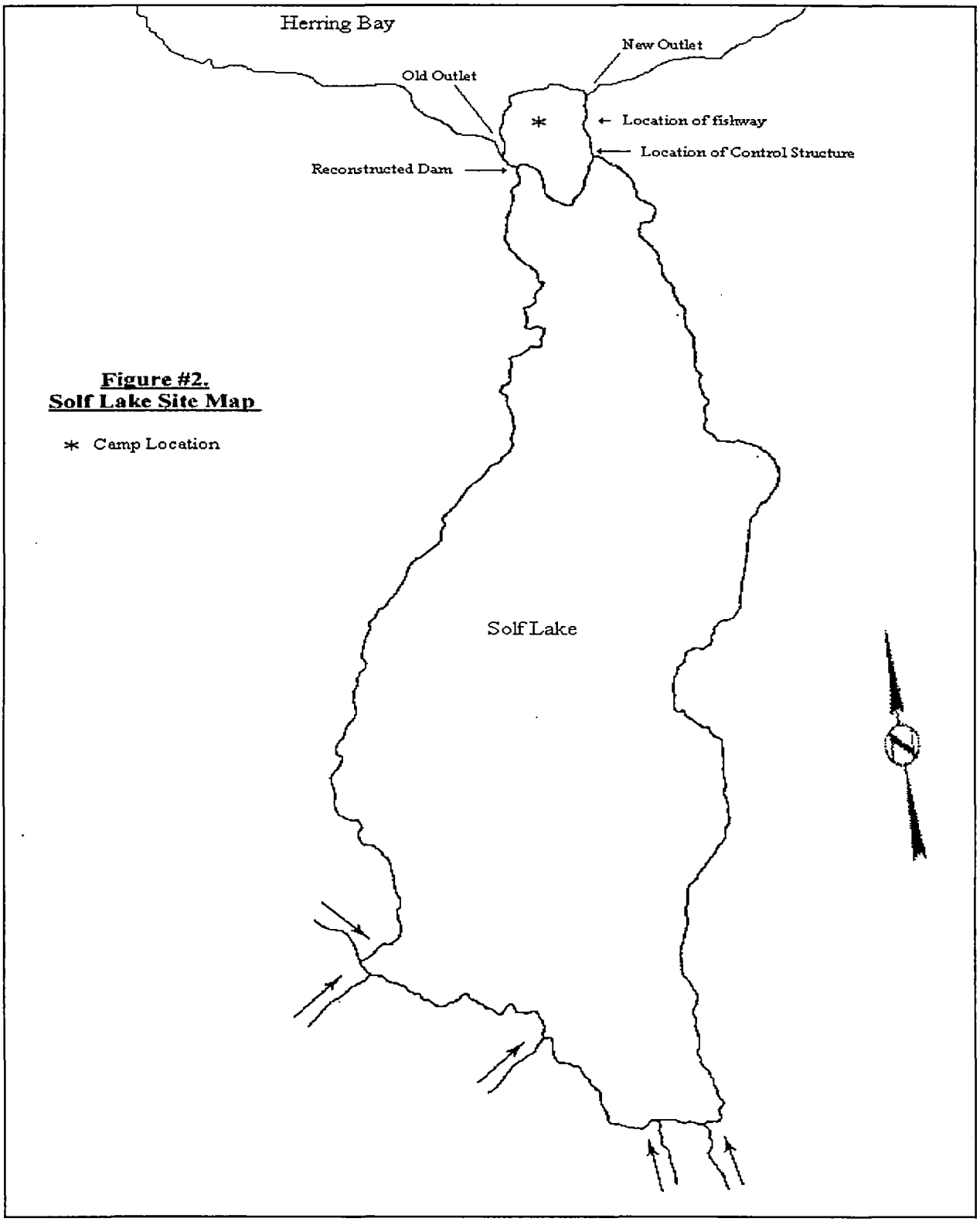


Figure # 3. Macrozooplankton Composition by Density.

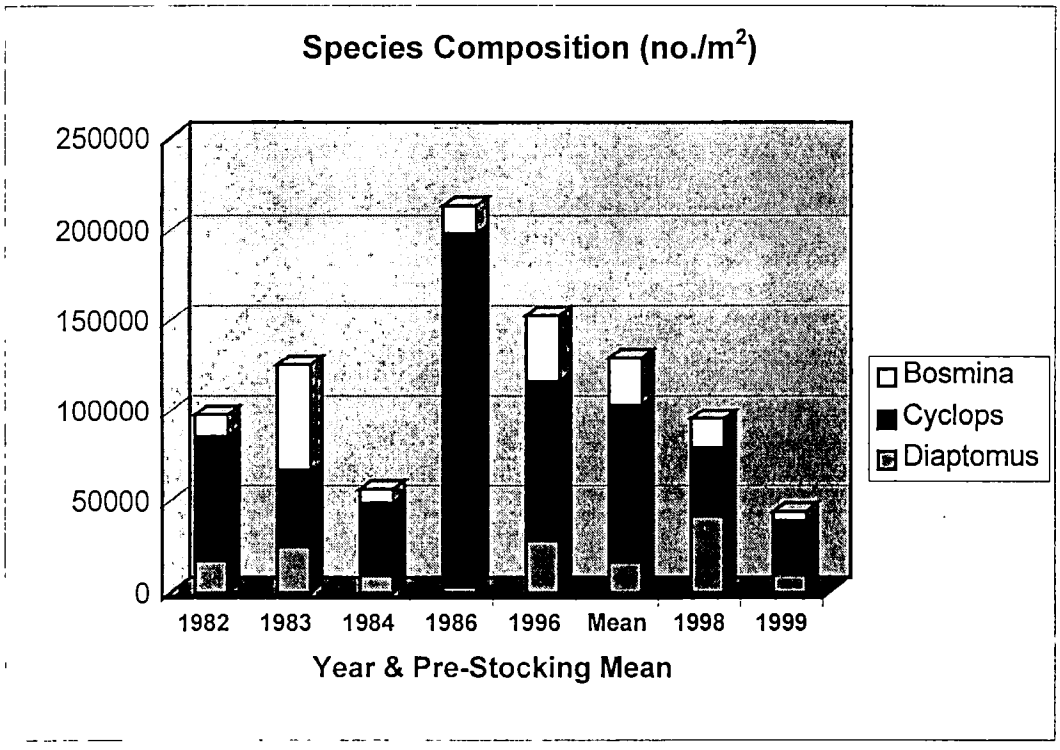


Figure # 4. Macrozooplankton Biomass (mg/m2).

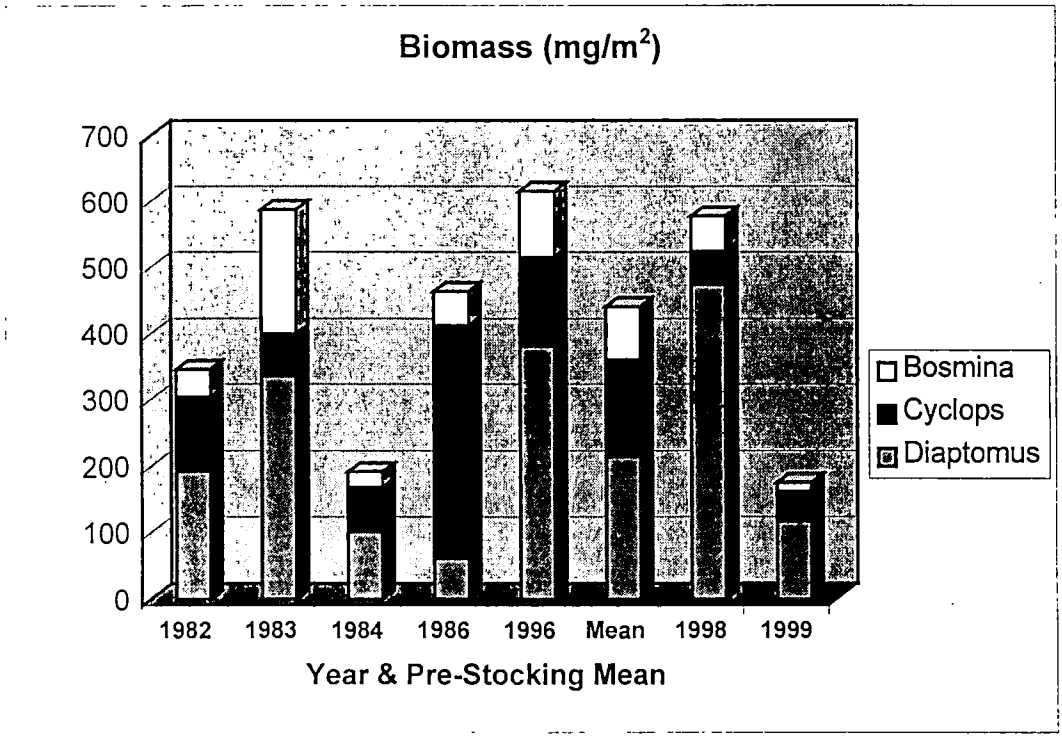
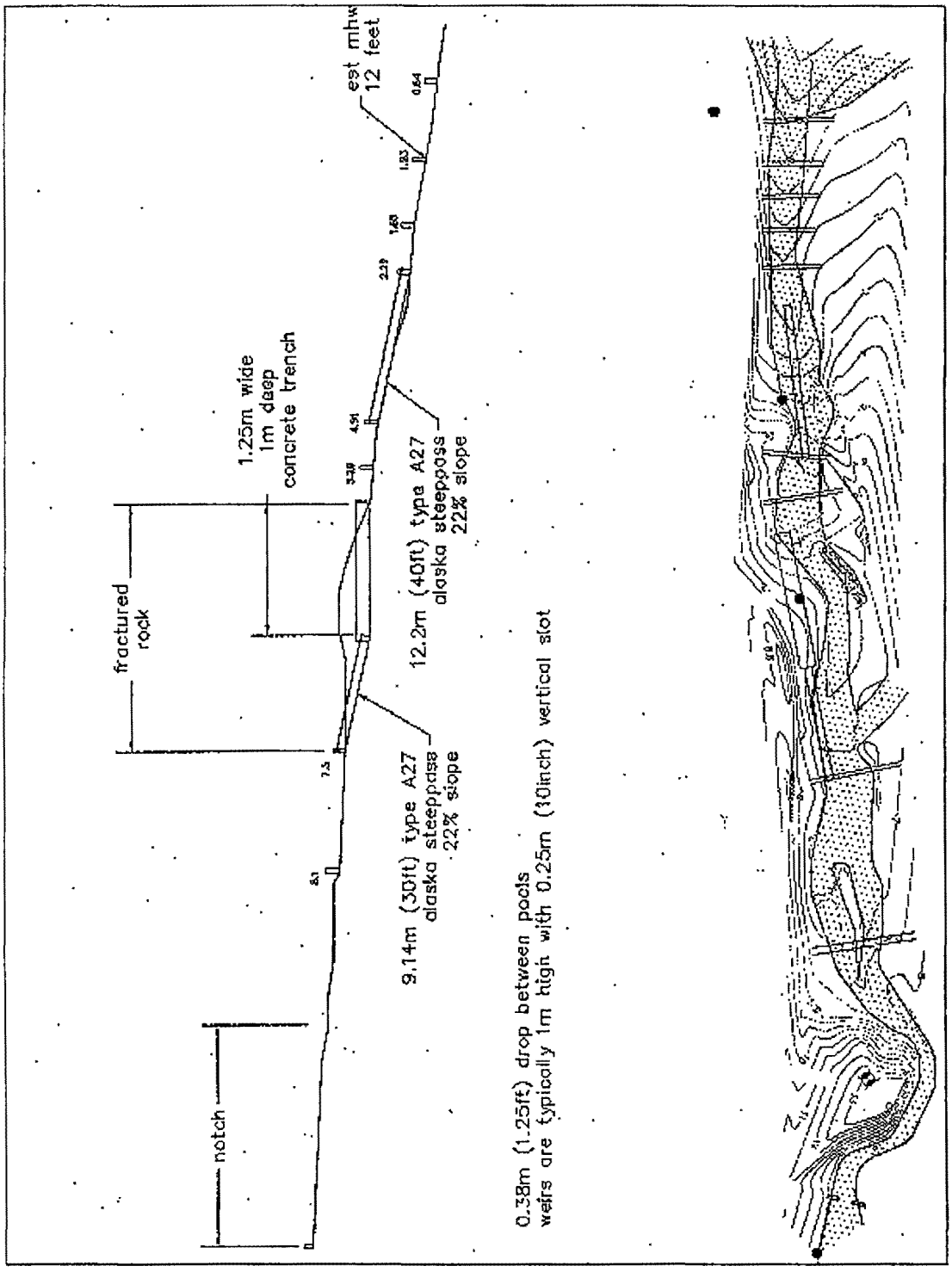


Figure # 5. View Plan Solf Fishway.



Revision 7-10-00
Approved 7-3-00

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001	PROPOSED FY 2001 TRUSTEE AGENCIES TOTALS					
			ADEC	ADF&G	ADNR	USFS	DOI	NOAA
				$6.5		$17.9		
Personnel	$70.3	$14.5						
Travel	$8.4	$0.4						
Contractual	$23.2	$6.6						
Commodities	$38.8	$0.3						
Equipment	$6.7	$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$147.4	$21.8				Estimated		
General Administration	$12.1	$2.6				FY 2002	FY2003	
Project Total	$159.5	$24.4				$20.0		
Full-time Equivalents (FTE)	0.0	0.4						
	Dollar amounts are shown in thousands of dollars.							
Other Resources	$0.0	$0.0				$0.0		

Comments:This is a continuation of project 00256B between the US. Forest Service and the Alaska Department of Fish and Game.

FY01

Prepared:

Project Number: 01256b
Project Title: Sockeye salmon stocking: Solf Lake
Lead Agency: USFS

FORM 2A
MULTI-TRUSTEE
AGENCY
SUMMARY

2001 EXXON VALDEZ TRUS' OUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001	LONG RANGE FUNDING REQUIREMENTS					
Personnel	$26.3	$5.3						
Travel	$0.4	$0.4						
Contractual	$2.5	$0.0						
Commodities	$3.3	$0.0						
Equipment	$2.5	$0.0						
Subtotal	$35.0	$5.7				Estimated FY 2002		
General Administration	$4.1	$0.8						
Project Total	$39.1	$6.5						
Full-time Equivalents (FTE)		0.1						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Report writing and annual workshop.

FY01

Project Number: 01256b
Project Title: Sockeye salmon stocking: Solf Lake
Agency: ADF&G

FORM 3A
TRUSTEE
AGENCY
SUMMARY

Prepared:

2001 EXXON VALDEZ TRUS :OUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2001
Gary Todd	FB2	16D	1.00	5.3		5.3
Richard Dederick	FTII	9F				0.0
Denise Cialek	FTIII	11L				0.0
Seasonal	FTII					0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
Subtotal			1.0	5.3	0.0	
					Personnel Total	$5.3

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2001
Air fare (1 round trip to Anchorage)	0.1	1	3	0.1	0.4
Whitter tunnel fare (2 round trip)					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.4

FY01

Prepared:

Project Number: 01256b
Project Title: Sockeye salmon stocking: Solf Lake
Agency: ADF&G

FORM 3B
Personnel
& Travel
DETAIL

2001 EXXON VALDEZ TRUS :OUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Contractual Costs:	Proposed FY 2001
Description	
Air Charter ($350 hr, 2.5 hr round trip), six round trips Hydroacoustic survey analysis ($750 each), two surveys Calibrate hydroacoustic equipment	
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$0.0

Commodities Costs:	Proposed FY 2001
Description	
Per Diem (2 crew for 25 days @ $18 day each) Misc. supplies and equipment (fry seine, sampling supplies)	
Commodities Total	$0.0

FY01

Prepared:

Project Number: 01256b
Project Title: Sockeye salmon stocking: Solf Lake
Agency: ADF&G

FORM 3B
Contractual & Commodities DETAIL

2001 EXXON VALDEZ TRUS :OUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2001
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency

FY01

Prepared:

Project Number: 01256b
Project Title: Sockeye salmon stocking: Solf Lake
Agency: ADF&G

FORM 3B
Equipment
DETAIL

2001 EXXON VALDEZ TRUS :OUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001
Personnel	$44.0	$9.2
Travel	$8.0	$0.0
Contractual	$20.7	$6.6
Commodities	$35.5	$0.3
Equipment	$4.2	$0.0
Subtotal	$112.4	$16.1
General Administration	$8.0	$1.8
Project Total	$120.4	$17.9
Full-time Equivalents (FTE)		0.3
Other Resources		

LONG RANGE FUNDING REQUIREMENTS

			Estimated FY 2002	FY2003	
			$20.0	$5.0	

Dollar amounts are shown in thousands of dollars.

Comments: This covers administrative cost for report preparation and monitoring of adult salmon returns and fishpass effectiveness.

FY01

Prepared:

Project Number: 01256b
Project Title: Sockeye salmon stocking: Solf Lake
Agency: USFS

FORM 3A
TRUSTEE
AGENCY
SUMMARY

2001 EXXON VALDEZ TRUS :OUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2001
Dan Gillikin	Fish Technician	GS-9	1.5	3.5		5.3
Rob Spangler	Fish Biologist	GS-9	0.5	4.2		2.1
Seasonal	Fish Technician	GS-5	1.0	1.8		1.8
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		3.0	9.5	0.0	
					Personnel Total	$9.2

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2001
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY01

Prepared:

Project Number: 01256b
Project Title: Sockeye salmon stocking: Solf Lake
Agency: USFS

FORM 3B
Personnel
& Travel
DETAIL

2001 EXXON VALDEZ TRUS :OUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Contractual Costs:	Proposed FY 2001
Description	
Egg Take, Incubation, Marking and Release. PWSAC Contract at Main Bay	4.2
Air Charter 4 trips @ $600/trip	2.4
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$6.6

Commodities Costs:	Proposed FY 2001
Description	
Camp food	0.3
Commodities Total	$0.3

FY01

Prepared:

Project Number: 01256b
Project Title: Sockeye salmon stocking: Solf Lake
Agency: USFS

FORM 3B
Contractual & Commodities DETAIL

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2001
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency
Forest Service Landing Craft	1	USFS

FY01

Project Number: 01256b
Project Title: Sockeye salmon stocking: Solf Lake
Agency: USFS

FORM 3B
Equipment
DETAIL

Prepared:

Approved TC 8-3-00

Scoter Life History and Ecology: Linking Satellite Technology with Traditional Knowledge to Conserve the Resource

Project Number:	01273-CLO
Restoration Category:	Research
Proposer:	D. Rosenberg/ADFG
Lead Trustee Agency:	ADFG
Cooperating Agencies:	None
Alaska SeaLife Center:	No
New or Continued:	Cont'd
Duration:	4th yr. 4 yr. project
Cost FY 01:	$50.1
Cost FY 02:	$0.0
Geographic Area:	Prince William Sound
Injured Resource/Service:	Subsistence, scoters

ABSTRACT

This project will provide closeout funding for the scoter satellite telemetry and traditional ecological knowledge project. A final report and manuscripts will be prepared, reporting on the findings of this three-year effort.

INTRODUCTION

This project will complete a 3-year project studying the life history and distribution of surf scoters (*Melanitta perspicillata*) and white-winged scoters (*M. fusca*) that winter or migrate through Prince William Sound (PWS) and integrate this information with traditional ecological knowledge collected from community members within the study area. In the first year (FY98) we initiated a pilot project to test the feasibility of catching scoters in PWS. In late-April and early-May, 1998 we marked ten surf scoters with surgically implanted satellite transmitters (Rosenberg and Petrula 1999a). We expanded the project in FY99 by using EVOS funding to obtain additional matching funds. In FY99 we marked 15 surf scoters and 10 white-winged scoters. Experiencing high post-surgical mortality rates in FY98 and FY99 we modified the project in FY00 and transported wild captured surf and white-winged scoters to the Alaska SeaLife Center in order to observe the effects of implants in a predator free environment. Healthy birds were released to the wild prior to spring migration.

This was the first study to use satellite telemetry in scoters. Satellite telemetry is providing information that allows us to define breeding, molting, and wintering areas of this important subsistence resource. We have identified nesting areas in the Northwest and Yukon territories, and interior Alaska; molting areas in the Northwest Territories and western Alaska, and wintering areas in PWS, the Alaska Peninsula, southeast Alaska, and British Columbia. We have also identified the timing of migration, migration routes, and the importance of PWS herring spawn to scoters throughout the Gulf of Alaska. This information is already being incorporated into the interpretation of and future planning for long-term population trend surveys in Alaska and Canada.

We have created an Internet site that provides information on this project, the life history of scoters, and weekly movements of satellite transmitted birds (Rosenberg and Petrula 1999b). As we will continue to receive information from transmitters deployed in FY00, we will continue to update this web site. Movements of marked birds will be updated regularly. The web site received over 2,000 visits in FY99-FY00.

Prior to this study, little was known about the seasonal distribution, timing of migration, and migration routes of scoters anywhere in North America. Affiliations between breeding and wintering areas were unknown, compounding meaningful integration of the existing survey data. The susceptibility of seaducks to contaminants is also a concern to resource managers and subsistence consumers. Determining distribution is the first step in assessing breeding, wintering, and molting ecology. Breeding, molting, and wintering sites have been identified throughout Alaska and western Canada.

Because satellite transmitters may still be transmitting data beyond the end of FY00, funds are budgeted for downloading and processing of data through Service Argos Inc. and web site maintenance. We will prepare a final report and manuscripts for publication in peer reviewed journals.

NEED FOR THE PROJECT

A. Statement of Problem

Scoters are an important subsistence resource to the people living in the communities of PWS and LCI (James Fall, ADF&G, pers. comm., Gary Kompkoff, Tatitlek IRA, pers. comm.) These species of seaducks comprise the large majority of the sea duck harvest in the communities of Tatitlek, Chenega Bay, Port Graham, and Nanwalek (Scott et al. 1996). Residents of the communities affected by the *Exxon Valdez* Oil Spill remain concerned about the abundance of their traditional food resources and maintaining their cultural ties to their traditional use of fish and wildlife (*Exxon Valdez* Oil Spill Trustee Council, 1999).

Scoters are among the least studied of North American waterfowl (Godfrey 1989, Savard and Lamothe 1991, Henny et al. 1995, Savard et al. 1998). Little is known about the ecology, breeding areas, molting areas, and migration routes of these species anywhere in North America (Bellrose 1976; Herter et al. 1989; Goudie et al. 1994, Savard et al. 1998). Basic ecological information is lacking for scoter populations that use PWS.

Since 1977, scoters in Alaska have been estimated to decline by as much as 40% (Hodges et al. 1996). Between 1973 and 1989 estimated winter populations of scoters in PWS declined from 56,600 to 14,800 birds. An estimated 1,000 scoters died as a direct result of the *Exxon Valdez* oil spill (John Piatt, pers. comm.). The large decline in PWS between 1972-1973 and 1989 may be a result of long-term oscillations in ocean temperatures in the Gulf of Alaska (Piatt and Anderson 1996) or effects from exposure to contaminants. Several studies have shown scoters and other sea ducks to bioaccumulate trace metals and organochlorines from their environment (Vermeer and Peakall 1979, Henny et al. 1991, Olendorf et al. 1991, Henny et al. 1995).

In winter, scoters feed in intertidal and subtidal zones, areas susceptible to contaminants (Vermeer and Peakall 1979). They feed primarily on bivalves, especially mussels (Crow 1978, Vermeer 1981), but in spring they may switch to a diet composed primarily of herring roe (Vermeer 1981, Goudie et al. 1994, Bishop and Green 1999). Mussels and intertidal sediments in PWS showed increases in petroleum hydrocarbon concentrations directly attributable to *Exxon Valdez* oil (Short and Babcock 1996), and oil in mussel beds in PWS and the Kenai Peninsula persisted for several years after the spill (Babcock et al. 1996). Further, the PWS herring stocks suffered a dramatic decline in 1993 and stocks have remained depressed (Morstad et al. 1997). The large increase in sea otter populations since the mid-1900's may have led to increased competition for food between scoters and otters (Nanwalek residents, pers. comm.). Quite likely, any decline results from a combination of factors such as food and habitat changes, contaminants, or climate change.

Human activities, such as hydroelectric development (Savard and Lamothe 1991), estuarine pollution (Ohlendorf et al. 1991), or introductions of exotic species (Bordage and Savard 1995) on the breeding, wintering, or molting areas potentially have profound affects on abundance or distribution of a population. The lack of information on distribution and migration patterns can prevent the identification of potential harmful environmental exposures or alterations and make it

extremely difficult to determine possible causes of population declines. Location of and links between breeding grounds, migration routes, and timing of migration are important factors used to evaluate contaminant uptake or loss in a migratory species as well as changes to food resources and other environmental changes (Henny et al. 1991). Nesting is considered one of the weakest links in the life cycle, especially with regard to contaminant effects (Henny et al. 1995).

B. Rationale/Link to Restoration

Although scoters are known to breed throughout much of Alaska and Canada (Gabrielson and Lincoln 1959; Godfrey 1986), until this project (Rosenberg and Petrula 1999) nothing was known about specific populations and the affiliations between winter, breeding, and molting areas. The few studies that have identified molting sites have not made the link between these and winter and breeding areas (Johnson and Richardson 1982, Dau 1987).

Exposure of migratory waterfowl to contaminants or other mortality factors may occur during migration, nesting, molting, or at wintering areas. Knowing the location of breeding grounds, migration routes, and winter areas, and the timing of migration will allow us to direct sampling and monitoring efforts at specific population segments. Scoter populations are susceptible to natural and man-made disturbances over a wide and inaccessible geographic area.

The traditional marking of birds with metal leg bands has had little success with sea ducks because so few birds are killed in the harvest. The vast geographic range of the birds (Rosenberg and Petrula 1999a, Rosenberg and Petrula 1999b) makes conventional telemetry impractical and costly. Satellite telemetry studies offer the best method for identifying migration routes, staging areas, and breeding, molting, and wintering sites. We will also report on the findings of the FY00 field season. In FY00 we held birds at the Alaska SeaLife Center in an effort to understand the reasons for the high rates of mortality experienced in these birds from implanting satellite transmitters. Finding a solution to the high rate of mortality experienced by implanting satellite transmitters in sea ducks in winter and spring in marine environments will allow for the continued use of this valuable technology.

Restoration requires assessment of population health and definition of impediments to recovery. The information in this report will help resource managers understand factors that affect population dynamics in surf scoters, interpret survey data, design better surveys, and develop management strategies to ensure the long-term health and welfare of the population. Without an understanding of the underlying events that influence population change, we can not prescribe specific activities to conserve or enhance the population.

C. Location

No new fieldwork will be conducted in FY01. As satellite transmitters will continue to function we will continue to receive and process data on scoter movements and distribution. Community involvement will be focused in the villages of Tatitlek, Chenega Bay, Nanwalek, and Port Graham.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

This program will continue to exchange information with residents of the communities of Prince William Sound and lower Cook Inlet. In FY98 and FY99 the principal investigator exchanged information and attended workshops in Tatitlek, Chenega Bay, Nanawalek, Seldovia, and Port Graham. The principal investigator was a member of the planning team for the youth-elders subsistence conference in Cordova and presented findings of this study at the conference and at the EVOS annual workshop. The principle investigator has also made presentations and exchanged information and ideas at community facilitator meetings in Anchorage.

The project will continue to inform and coordinate our community involvement activities, including the collection of indigenous knowledge with Dr. Henry Huntington, TEK specialist Chugach Regional Resources Commission; Hugh Short, Community Coordinator, EVOS Restoration Office; Rick DeLorenzo and Joshua Hall, Chugach School District; and the Subsistence Division of the Alaska Department of Fish and Game.

Project personnel will adhere to the protocols for including indigenous knowledge in the restoration process presented in Appendix C of the Invitation to Submit Restoration Proposals for Federal FY 2001. Boat and air charter contracts, and other services will be contracted from local sources when possible.

PROJECT DESIGN

A. Objectives

FY 01:

1) Analyze data from FY00 field season;

2) Incorporate data in current Geographical Information System developed for these studies;

3) Prepare final report including all information gathered from 1998-2000;

4) Update and maintain Web site; and

5) Prepare 2-3 manuscripts for publication in peer reviewed journals. Where appropraite manuscripts will be incorporated into the final report.

Publications:

The following is a list of publications. The actual number that will be submitted for publication in FY 01 will depend upon time and budget constraints.

Identifying links between breeding, wintering, and molting areas of surf scoters and white-winged scoters using satellite telemetry. Auk or Can. Field Naturalist.

Effects and performance of implantable satellite transmitters in surf and white-winged scoters. Waterbirds or J. of Field Ornithology.

Behavioral effects of internal and subcutaneous transmitters on captive scoters. Wildfowl.

Mortality and hematology associated with captivity in scoters. J. of Wildl. Diseases.

Using floating mist-nets to capture wintering seaducks in coastal waters. J. of Wildl. Manage.

Morphological measurements of spring staging scoters in Alaska. Wildfowl.

Traditional ecological knowledge, satellites, and migratory species: complementary approaches to ecological understanding. Proceedings of the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). Capetown, South Africa.

B. Methods

Analysis will follow methods in previous annual reports (Rosenberg and Petrula 1999a, Rosenberg and Petrula 2000, in prep.).

C. Cooperating Agencies, Contracts, and Other Agency Assistance

Contracts with Service Argos, Inc. for collecting and processing of satellite transmitted data will continue. No other contracts will be solicited for this report.

SCHEDULE

A. Measurable Project Tasks for FY 01

October-December:	Data entry and analysis. GIS and map preparation. Maintain Web site. Begin final report and manuscript preparation.
January-March:	Attend EVOS Restoration Workshop.

Continue data analysis and report and map preparation.
Maintain Web site

April 15: Submit final report and manuscripts.

B. Project Milestones and Endpoints

FY01

October-March: Finish final report and prepare manuscripts for publication.

FY02

October-March: Publish manuscripts.

C. Completion Date

All project objectives will be met following FY02.

PUBLICATIONS AND REPORTS

A final report of FY98-FY00 activities will be submitted to the Restoration Office before April 15, 2001. Manuscripts for peer reviewed journals will be submitted for publication prior to November 1, 2001.

PROFESSIONAL CONFERENCES

A paper on the results of this project will be presented to the North American Waterfowl Symposium, October 11-15, 2000, in Saskatoon, Saskatchewan.

NORMAL AGENCY MANAGEMENT

The work proposed here is not part of normal agency management and is related specifically to research addressing oil spill restoration concerns. No similar work has been conducted, is currently being conducted, or is planned using agency funds.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Results will be compared and integrated with other EVOS Trustee sponsored research where appropriate, including project /052B Traditional Ecological Knowledge.

PROPOSED PRINCIPAL INVESTIGATORS

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(907) 267-2453
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dan_rosenberg@fishgame.state.ak.us

PERSONNEL QUALIFICATIONS

Dan Rosenberg has been a waterfowl biologist for The Alaska Department of Fish and Game (ADF&G) since 1985. From 1980-1983 Mr. Rosenberg conducted field research in Alaska as a waterfowl biologist for the U.S. Fish and Wildlife Service and from 1983-1984 as a Habitat Biologist for ADF&G. Mr. Rosenberg received a Bachelor of Science degree in Wildlife Management from Humboldt State University, Arcata, CA in 1979.

Mr. Rosenberg has conducted harlequin duck population (age and sex structure) and production surveys in Prince William Sound since 1994 as the Principle Investigator of a Trustee sponsored restoration project. Mr. Rosenberg is currently the principal investigator on EVOS Trustee sponsored project \273 Surf Scoter Life History and Ecology: Linking Satellite Telemetry with TEK to Conserve the Resource. He has conducted extensive waterfowl population monitoring and habitat assessment surveys on the Copper River delta, Stikine River delta, Kenai wetlands, upper Cook Inlet, Aleutian Islands, and Kodiak Island. As project leader, Mr. Rosenberg has assessed impacts to waterfowl and wildlife populations from hydroelectric development, urban expansion, habitat alterations, chemical pollutants, timber harvest, and surface mining.

OTHER KEY PERSONNEL

Mike Petrula, Wildlife Biologist, ADFG. Field logistics, surveys, data analysis, and report preparation. Mr. Petrula has an MS degree in wildlife Biology from the Univ. of Alaska, Fairbanks. He has been working on EVOS projects \427 Harlequin Duck Recovery Monitoring and \273 Surf Scoter Life History and Ecology: Linking Satellite Telemetry with TEK to Conserve the Resource.

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Revision 7-19-00.
approved TC 8-3-00

2001 EXXON VALDEZ TRUST OUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001
Personnel	$84.2	$38.4
Travel	$8.4	$3.5
Contractual	$67.7	$2.3
Commodities	$27.1	$0.0
Equipment	$0.6	$0.0
Subtotal	$188.0	$44.2
General Administration	$17.4	$5.9
Project Total	$205.4	$50.1
Full-time Equivalents (FTE)	1.4	0.5
Other Resources		

LONG RANGE FUNDING REQUIREMENTS

			Estimated FY 2002		
			$1.0		

Dollar amounts are shown in thousands of dollars.

Comments:
Close Out for Project /273 Scoter

FY01

Project Number: 01273
Project Title: Scoter life history and ecology: Linking satellite technology with traditional knowledge - Close Out
Agency: Alaska Department of Fish and Game

FORM 3A
TRUSTEE
AGENCY
SUMMARY

Prepared:4/5/00,rev.6/23/00,rev7

2001 EXXON VALDEZ TRUST OUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2001
D. Rosenberg	WBIII, Principle Investigator	18J	6.5	5.9		38.4
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		6.5	5.9	0.0	
					Personnel Total	$38.4

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2001
North American Waterfowl Symposium -Saskatchewan, Canada	1.0	1	6	0.1	1.6
Conference Registration Fee					0.1
Anchorage-Tatitlek by air	0.4	1	2	0.1	0.6
Anchorage-Chenega by air	0.4	1	2	0.1	0.6
Anchorage -Port Graham/Nanwalek by air	0.3	1	2	0.1	0.5
Airport parking, taxi fare, EVOS Workshop parking.					0.1
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$3.5

FY01

Project Number: 01273
Project Title: Scoter life history and ecology: Linking satellite technology with traditional knowledge - Close Out
Agency: Alaska Department of Fish and Game

FORM 3B
Personnel
& Travel
DETAIL

Prepared:4/5/00,rev.6/23/00,rev7

2001 EXXON VALDEZ TRUST OUNCIL PROJECT BUDGET
October 1, 2000 eptember 30, 2001

Contractual Costs:	Proposed
Description	FY 2001
Photo processing, Conference presentation products	0.3
Satellite telemetry data downloading. 5 Transmitters at $406/Transmitter	2.0
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$2.3

Commodities Costs:	Proposed
Description	FY 2001
Commodities Total	$0.0

FY01

Project Number: 01273
Project Title: Scoter life history and ecology: Linking satellite technology with traditional knowledge - Close Out
Agency: Alaska Department of Fish and Game

FORM 3B
Contractual & Commodities DETAIL

Prepared:4/5/00,rev.6/23/00,rev

2001 EXXON VALDEZ TRUST OUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2001
NONE			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY01

Project Number: 01273
Project Title: Scoter life history and ecology: Linking satellite technology with traditional knowledge - Close Out
Agency: Alaska Department of Fish and Game

FORM 3B
Equipment
DETAIL

Prepared:4/5/00,rev.6/23/00,rev7/19/00

Approved TC 8-3-00

The Exxon Valdez Trustee Hydrocarbon Database and Interpretation Service

Project Number:	01290
Restoration Category:	Service Project
Proposer:	Bonita D. Nelson and Jeffrey W. Short NMFS, Auke Bay Laboratory ABL Program Manager: Dr. Stan Rice NOAA Program Manager: Bruce Wright
Lead Trustee Agency:	NOAA
Cooperating Agencies:	None
Alaska SeaLife Center:	No
Duration:	Service Ongoing
Cost FY 01:	35,000
Cost FY 02:	35,000
Cost FY 03:	35,000
Geographic Area:	Not Applicable
Injured Resource/Service:	Maintenance of the Trustee hydrocarbon database, archival of environmental samples, interpretative services

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 hydrocarbon and pristane databases and store and maintain the hydrocarbon sample archives.

INTRODUCTION

The Auke Bay Laboratory provides data and sample archiving services for all samples collected for hydrocarbon analysis in support of *Exxon Valdez* Trustee Council projects. These data represent samples collected since the oil spill in 1989 to the present and include environmental and laboratory Response and Restoration data . Additionally, we provide interpretive services for the hydrocarbon analyses. Currently, the database contains results of the hydrocarbon analysis of more than 13,000 samples and collection information from more than 50,000 sediments, tissues, water, or oil samples. The primary purpose of this project is to maintain the integrity of the database, incorporate new data and continue hydrocarbon data interpretive services. This year we are proposing to continue the this task. The second purpose is to make the results of the hydrocarbon analyses (including pristane analysis) available to principal investigators, resources managers and to the public. This service is expected to have activity as long as hydrocarbon data are collected.. The third purpose of this project is to maintain the integrity of archived samples in freezers many of which have not yet been analyzed for hydrocarbons.

The Trustee hydrocarbon database not only contains sample collection and hydrocarbon analyses information, but also has data concerning sample shipping and location information as well as lists of other database identifiers (such as species and location codes). A public version of this database containing the sample collection and environmental hydrocarbon sample analyses was released in 1996 (*Exxon Valdez* Oil Spill of 1989: State/Federal Trustee Council Hydrocarbon Database 1989-1995 -EVTHD) . Updating the database and the public release is an on-going program. Samples from pink salmon projects (01454, 01456) , pristane (01195) and coal/oil seep project (01599) as well as well as other invited proposals concerning mussel bed sampling will be added in FY2001.

The hydrocarbon interpretive service is designed specifically for investigators and managers. This includes: (1) identification of the probable sources of the hydrocarbons observed in the samples, (2) evaluation of new hydrocarbon data for evidence of systematic bias, (3) hydrocarbon data editing according to consistent criteria. Recently interpretation has grown to include identification of potential hydrocarbon sources (e.g. coal) for the background hydrocarbon signal in PWS. This is a continuation of project 98290 and previously funded under TS#1, 93090, 94290, 95290, 96290 , 97290, 98290, 99290 and 00290.

NEED FOR THE PROJECT

A. Statement of Problem

The Trustee hydrocarbon database is a dynamic structure which requires updating and maintenance. Currently, the database contains an inventory of the Trustee hydrocarbon sample collection and provides for retrieval of hydrocarbon analyses by principal investigators and managers. This project is designed to provide easy access to the Trustee hydrocarbon database and ensure the accuracy of the data. The volume of data contained in the database suggests that

other users will benefit from access, particularly as more data is added and long term monitoring projects come on line via the GEM management plan.

B. Rationale/Link to Restoration

Archiving of the Trustee hydrocarbon sample data will ensure that these data are available to principal investigators, government agencies, and the interested public on a timely basis. The database allows direct comparison of restoration and NRDA data, and contains an inventory of hydrocarbon samples and information about their collection, storage and analysis. The continued use of the methods for hydrocarbon data evaluation and interpretation developed for the *Exxon Valdez* NRDA samples will insure direct comparability of future with previous samples. This will substantially increase the probability that temporal trends in these data will be detected when actually present. Principal investigators will be able to get assistance with chemical interpretation of hydrocarbon results from their project or other projects that relate to their project when needed. Since most investigators are not chemists, this type of assistance is usually required for proper interpretation of hydrocarbon results. Application of the petroleum weathering model developed under this project (Short and Heintz, 1997) has been used to compare coal samples and Katalla seep with Prince William Sound background samples, and has identified coal as the Abiologically non-available source, in contrast to researchers sponsored by EXXON, who have identified the source as Katalla seep oil.

C. Location

While this project resides at the Auke Bay Laboratory, Juneau , Alaska, the service provided serves the entire spill area. The public release of the database is available on the internet.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

Community involvement includes and extends beyond the spill area. Science centers, public schools, native corporations, universities, environmental organizations and other concerned groups will have access to the database with guidelines on how the data can be used.

PROJECT DESIGN

A. Objectives

1. Continue maintenance of the Trustee hydrocarbon database by updating the database with new information and continue the sample archiving procedures developed under NRDA.

2. Continue interpretation of hydrocarbon data, including new data produced for principal investigators and resources managers and for syntheses products as needed.

3. Maintain Pristane database for Trustee funded project.

4. Provide public release of the data via CD-Rom and on the internet.

5. Extend the use of the petroleum weathering model by using it as a tool for identifying potential sources of petroleum that contribute to the background signal identified in Constantine Harbor.

6. Implement a long-term archiving plan for the Trustee hydrocarbon database PWSOIL.

B. Methods

Data associated with hydrocarbon samples are added to the existing Trustee hydrocarbon database. The samples and data currently reside at the Auke Bay Laboratory of NMFS. Incoming samples are inventoried and stored in laboratory freezers, and sample collection information is entered into the database. Samples are released for hydrocarbon analysis after ABL receives a written request from the responsible project leader. Hydrocarbon data, reported by the analytical laboratory, are matched to the sample collection information and all the data are checked for errors and electronic copies are sent to principal investigators or other requesters. An updated version of the public release of the database will be developed in Visual Basic software using *Exxon Valdez* Oil Spill of 1989: State/Federal Trustee Council Hydrocarbon Database 1989-1995 (EVTHD) as a template and will include data collected from Trustee funded projects including sampling and analytical quality control procedures .The product is updated annually.

The petroleum weathering model developed under this project has been used to reject the hypothesis that the hydrocarbons comprising the background PAH source are derived from the Katalla oil seep. Analysis of sediment and mussel samples collected from locations near the Katalla oil seep as well as coal deposits east of PWS supports the conclusion that PAH derived from coal characterize the background hydrocarbon signal (Short et al., 1999). We will continue to use this information and analyses when necessary to demonstrate the generality of the weathering model with other oil sources and the absence of a similar weathering process in coal.

The Auke Bay Laboratory will continue to keep all environmental samples collected for hydrocarbon analysis under all phases of the oil spill process frozen in locked storage.

The pristane database will be maintained in ACCESS software. Information from samples collected under Trustee project 195 will be combined with data from the Trustee hydrocarbon database where applicable to provide a complete data set of pristane related information.

C. Contracts and Other Agency Assistance

No contracts are anticipated

SCHEDULE

A. Measurable Project Tasks for FY01

Samples will be stored and data analyzed throughout fiscal year. Release of the updated public version of the database software: Exxon Valdez Oil Spill of 1989: State/Federal Trustee Council Hydrocarbon Database 1989-1995.

B. Project Milestones and Endpoints

April 15: Annual report in the form of updated release of hydrocarbon data software.

The primary objective of this project is to provide an ongoing service, consequently there are few set milestone dates or endpoints.

C. Completion Date

This is an ongoing service project to be completed when samples are no longer collected for hydrocarbon analysis and the Trustee Council terminates this service.

PUBLICATIONS AND REPORTS

The public release of the hydrocarbon database for projects funded in FY00 will be available on or about 15 April, 2001 in the form of the annual report .Data are submitted as soon as they are available from the chemistry laboratory.

PROFESSIONAL CONFERENCES

One meeting is required, an annual Quality Assurance Control meeting attended by ABL=s Senior Analytical Chemist. The results of an international calibration exercise by participant is reviewed for the integrity and credibility of chemical analyses. This meeting usually occurs in the Washington D.C. area, and is sponsored by National Institute of Standards and Technology (NIST).

NORMAL AGENCY MANAGEMENT

NOAA/NMFS has statutory stewardship for most living marine resources; however, if the oil spill had not occurred, NOAA would not be conducting this project. NOAA/NMFS proposes to make a significant contribution (as stated in the proposed budget) to the operation of this project, making it truly cooperative.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

This project is a continuation of NRDA database and chemical interpretation work.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

This ongoing service project has no significant project design or schedule differences from the project funded in FY00, it is a continuation of the same service. The project has been downsized, as the input volume has decreased somewhat, although interpretation services will probably increase.

PROPOSED PRINCIPAL INVESTIGATOR

Bonita D. Nelson
NMFS Auke Bay Laboratory
11305 Glacier Highway
Juneau, Alaska 99801
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PRINCIPAL INVESTIGATORS

Bonita D. Nelson

Education:
BS 1979, University of Illinois, Urbana (Ecology, Ethology , Evolution)
MS 1986, University of Alaska-Juneau (Fisheries)

Other Revelant Experience:
Database manager of the Trustee hydrocarbon data for 6 years. Responsibilities include: supervision of data entry of sample and analytical data; processing and dissemination of data after interpretation by chemist; database management including data retrieval for production of the public versions of the database. Nelson has designed and managed databases as well as analyzed data for the radio telemetry program at the Auke Bay Laboratory for 15 years.

Jeffrey W. Short

Education:
BS, 1972 University of California, Riverside (Biochemisty & Philosophy)
MS, 1982, University of California, Santa Cruz (Physical Chemistry)

Other Experience:
1989 - Present: Established and managed the hydrocarbon analysis facility at ABL to analyze hydrocarbon samples generated by the *Exxon Valdez* NRDA effort (about 20% of these samples were analyzed at ABL).
1989 - 1992 : Principal Investigator, Exxon Valdez project Air/Water #3; Determination of petroleum hydrocarbons in seawater by direct chemical analysis and through the use of caged mussels deployed along the path of the oil spill.
1991 - 1992 : Principal Investigator, Exxon Valdez project Subtitle #8 ; Development of computer-based statistical methods for global examination of sediment and mussel hydrocarbon data produced for the Exxon Valdez NRDA effort for systematic bias, and for identification of probable sources of hydrocarbons. In addition, this project produced both hard-copy and computer display maps of all the sediment and mussel hydrocarbon data.

LITERATURE CITED

Short, J. W., K.A. Kvenvolden, P.R. Carlson, F. D. Hostettler, R. J. Rosenbauer, & B. A. Wright, 1999. Natural Hydrocarbon Background in Benthic Sediments of Prince Willaim Sound, Alaska: Oil vs Coal. Environ. Sci. Technol. 33:34-42.

Short, J. W., and R. A. Heintz. 1997. Identification of *Exxon Valdez* oil in sediments and tissues from Prince William Sound and the Northwestern Gulf of Alaska based on a PAH weathering model. Environ. Sci. Technol. 31:2375-2384.

Approved TC 8-3-00

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001						
Personnel	$41.7	$25.6						
Travel	$2.9	$2.9						
Contractual	$1.5	$0.4						
Commodities	$3.0	$2.2						
Equipment		$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$49.1	$31.1	Estimated	Estimated	Estimated			
General Administration	$6.4	$3.9	FY 2002	FY2003	FY2004			
Project Total	$55.5	$35.0	$35.0	$35.0	$35.0			
Full-time Equivalents (FTE)		0.3						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:
This project is ongoing to support the maintenance of samples collected for hydrocarbon analyses, srooting and archinginv of samples, interpretaion of chemical data and release of data to principal investigators and to the public.

NOAA Contribution: Research Chemist, Jeff Short, .5 months @ 5.0; Fishery Biologist Jacek Maselko 1.0 mo @ 5.23K, Analytical Chemist, Marie Larsen 1.0 mo @ 7.0 K for a total of 17.2 K.

FY01

Prepared: 4/10/00

Project Number: 01290
Project Title: **The Hydrocarbon Database & Interpretation**
Agency: NOAA

FORM 3A
TRUSTEE
AGENCY
SUMMARY

2001 EXXON VALDEZ TRUS . __ COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2001
Bonita Nelson	Fisheries Research Biologist	GS-11-04	4.0	6.4		25.6
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		4.0	6.4	0.0	
					Personnel Total	$25.6

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2001
					0.0
Quality assurance/quality control annual meeting, 1 senior chemist	1.5	1	3	0.2	2.1
					0.0
RT Juneau - Anchorage	0.4	1	2	0.2	0.8
EVOS Trustee workshop					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$2.9

FY01

Prepared: 4/10/00

Project Number: 01290
Project Title: **The Hydrocarbon Database & Interpretation**
Agency: NOAA

FORM 3B
Personnel
& Travel
DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Contractual Costs:	Proposed FY 2001
Description	
Disposal of Archi val samples or Freezer Maintenance	0.4
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$0.4

Commodities Costs:	Proposed FY 2001
Description	
Computer supplies, CD-ROMS and software	2.2
Commodities Total	$2.2

FY01

Prepared: 4/10/00

Project Number: 01290
Project Title: The Hydrocarbon Database & Interpretation
Agency: NOAA

FORM 3B
Contractual & Commodities DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2001
none			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY01

Prepared: 4/10/00

Project Number: 01401
Project Title: **The Hydrocarbon Database & Interpretation**
Agency: NOAA

FORM 3B
Equipment
DETAIL

Approved TC 8-3-00

Pigeon Guillemot Restoration Research at the Alaska SeaLife Center

Project Number:	01327-CLO
Restoration Category:	Research
Proposer:	D. Roby/OSU, G. Divoky/UAF
Lead Trustee Agency:	DOI
Cooperating Agencies:	None
Alaska SeaLife Center:	Yes
New or Continued:	Cont'd
Duration:	4th yr. 4 yr. project
Cost FY 01:	$86.9
Cost FY 02:	$0.0
Geographic Area:	Resurrection Bay
Injured Resource/Service:	Pigeon guillemots

ABSTRACT

This project tests the feasibility of restoration techniques for pigeon guillemots (e.g., installation of artificial nest sites, use of social attractants, captive propagation and release). It also includes controlled experiments crucial to two other restoration objectives: (a) development of nondestructive biomarkers of petroleum hydrocarbon contamination in seabirds and (b) understanding how dietary factors (prey species composition, prey size, lipid content, feeding frequency) constrain growth, development, and condition at fledging in guillemots and other fish-eating seabirds.

STUDY HISTORY

The first field season for this study was in 1998. During the 1998 field season a total of 44 guillemot eggs and 2 guillemot chicks were collected from nests in the wild and transported to the SeaLife Center for incubation and/or captive rearing. A total of 23 eggs were hatched (52% hatching success) and a total of 23 chicks were successfully fledged from the roof of the SeaLife Center. Blood samples were collected from chicks at predetermined ages for baseline levels of certain biomarkers. Chicks were raised on one of four types of forage fish: juvenile Pacific herring, Pacific sand lance, juvenile walleye pollock, or crescent gunnels. Growth rates were monitored on all chicks and they was found to be positively correlated with daily energy intake.

Success in hatching the 70 eggs collected in 1999 was 70% as compared with the 52% hatching success in the first year of the project. The increase in hatching success between the first and second years of this project are likely due to: 1) the differential success of hatching from different sites, 2) decreased vibration or other unintentional mishandling of the eggs in 1999, compared to 1998, after collection leading to damage to the developing embryo and/or 3) the horizontal transport of eggs in 1999 as compared to the vertical egg transportation in 1998. Nestling survival for chicks collected in the wild in 1999 was 89.3%, whereas it was only 71.4% for chicks hatched from eggs that were artificially incubated. All mortality for chicks collected in the wild (n = 3) occurred soon after collection, either in the field or during transport. All mortality for chicks hatched in captivity (n = 14) occurred in the first 11 days post-hatch and was apparently due to either brooder equipment malfunction (n = 9), lower GI tract blockage of unknown causes (n = 3), or microbial infections of the lower GI tract (n = 2). Thus, 61% of all eggs and chicks collected for captive-rearing in 1999 were successfully fledged into the wild. The fledging time of these chicks was found to correlate remarkably well with the period of civil twilight. In 1999, chicks were raised on two different forage fish: juvenile Pacific herring and juvenile walleye pollock. Once again, growth was found to be positively correlated to daily energy intake. Groups of chicks were dosed with different levels of weathered Prudhoe Bay crude oil (PBCO). Blood samples and excreta samples were taken before and following dosing for ongoing and future examination of biomarkers for oil exposure.

INTRODUCTION

The Pigeon Guillemot (*Cepphus columba*) population in Prince William Sound has failed to recover from declines that occurred both before and after the *Exxon Valdez* Oil Spill (EVOS). Post-spill studies of Pigeon Guillemot reproductive success have identified three primary factors preventing recovery:

1) In Prince William Sound (Naked and Jackpot islands) and Kachemak Bay, predation on eggs and chicks has been a major source of nesting failure (Hayes 1996, Prichard 1997, Golet 1999).

2) There has been a decline in the proportion of sand lance in the diet at some guillemot colonies in Prince William Sound (e.g., Naked Island) and Kachemak Bay, and the proportion of high-lipid schooling forage fish in the diet has been shown to be a key factor in guillemot reproductive success at both sites. The Alaska Predator Ecosystem Experiment (APEX) Project components F (Factors Limiting Pigeon Guillemot Recovery), G (Seabird Energetics), and M (Seabird/Forage Fish Studies in Lower Cook Inlet) are investigating the relationship between a lack of recovery in guillemot populations injured by the EVOS and the availability and quality of forage fish. A decline in availability of high-lipid forage fishes (sand lance, herring, capelin) in the last two decades may be responsible for lower growth rates, fledging weights, post-fledging survival, and adult recruitment in guillemot populations within the oil spill area.

3) The Nearshore Vertebrate Predator (NVP) Project (River Otter and Pigeon Guillemot component) tested the hypothesis that exposure to residual oil from the spill continues to limit recovery of Pigeon Guillemots. Pigeon Guillemots feed on a diversity of nearshore demersal fishes and schooling forage fish that use the substrate to avoid predators (e.g., sand lance), prey that were likely injured by EVOS. The approach of the NVP study is to measure certain biomarkers in blood and compare biomarker levels in nestlings from oiled and nonoiled areas.

These blood biomarkers still need to be calibrated to known doses of weathered Prudhoe Bay Crude Oil (PBCO) in a controlled, laboratory setting.

This research has been and is being conducted at the Alaska SeaLife Center in Seward and addresses all three of the above limiting factors. Experimental studies using captive subjects are integrated with raising Pigeon Guillemot nestlings in captivity in order to establish free-ranging guillemot breeding colonies in the vicinity of the SeaLife Center. Predator-free nest sites have been built in the vicinity of the SeaLife Center and, in association with the use of decoys and audio playbacks of guillemot calls, are being used to help attract and recruit prospecting guillemots to breed. Guillemot populations are frequently nest-site limited (Storer 1952) and Pigeon Guillemots readily breed in anthropogenic structures, such as docks and breakwalls, at many locations throughout the species' range. Like most seabirds, guillemots are philopatric to their natal location, and cohorts raised in captivity at the SeaLife Center and released there can be expected to return and attempt to breed in the surrounding area. Although guillemots only rarely breed before three years of age, prospecting 2-year-olds that were raised in the first year of this three-year study can be expected to visit the SeaLife Center during the 2000 breeding season and furthermore, guillemots from the larger 1999 cohort may be expected to be seen during the 2001 breeding season.

Providing artificial nest sites has the potential to restore guillemot populations through enhancing both local recruitment of adults and nesting success. Our success in recruiting prospecting adult guillemots to use artificial nest sites and the proportions of captive-reared and immigrant guillemots that utilize artificial nest sites will allow us to test the feasibility of this direct restoration technique for enhancing recovery of guillemot populations in the EVOS area.

The proposed work is intended to result in the establishment of breeding colonies of free-ranging Pigeon Guillemots near the SeaLife Center. By banding immigrants to the colony and young that are raised and released at the SeaLife Center, we can establish a breeding colony comprised of known-age individuals whose breeding history is known. Accessibility of nest sites can be a major obstacle for studies of factors influencing nesting success and demographics of guillemots, and artificial nests sites can provide investigators with unique opportunities. A dockside Black-legged Kittiwake colony in Great Britain has been studied for the past 30 years and provided most of what is known about that species in the northeastern Atlantic (i.e., Coulson 1988). Establishment of Pigeon Guillemot colonies near the SeaLife Center has the potential of providing a similar resource, in addition to providing opportunities for integration with ASLC's public education program.

Besides providing recruits for the breeding colony of free-ranging guillemots to be established at ASLC, raising chicks in captivity will also provide the opportunity to conduct controlled experiments that are relevant to two major issues in Pigeon Guillemot restoration: (1) the effect of prey type, size, quality, and frequency of delivery on nestling growth rates and condition of young at fledging and (2) the utility of biomarkers in blood and excreta as indicators of exposure to crude oil and other environmental contaminants. Research on these two topics can best be conducted using captive subjects whose environment and diet can be carefully controlled to avoid confounding variables so common in natural populations. In the first three years of this study (1998-2000), chicks were raised on different diet regimes to determine the effects of the prey type on growth rates. Chicks were fed either high-lipid schooling forage fishes (sand lance, herring), low lipid forage fish (juvenile walleye pollock), or nearshore demersal fishes (crescent gunnel, high cockscomb). These controlled feeding experiments end in FY 2000. The results from this study will complement continuing studies on the role of diet for productivity of nesting guillemots that are part of the APEX Project.

In FY 1999 and 2000, some chicks that are raised in captivity have been fed small, sublethal doses of weathered Prudhoe Bay crude oil (PBCO). Subsequent to dosing, samples of blood and excreta have been collected at prescribed intervals for measurement of biomarkers of health status. These results will allow us to define the dose-response relationship between ingested

PBCO and each biomarker of exposure. Such results are essential for evaluating the efficacy of particular biomarkers and the utility of these biomarkers for assessing the exposure of free-ranging guillemots to oil.

Of particular value for interpretation of the results of captive feeding trials and crude oil dose-response experiments will be the subsequent release of these subjects and measurements of their return rates in subsequent years. Although it can not be assumed that all young guillemots that are fledged from the ASLC and survive to breeding age will return to breed near ASLC, the return rates of nestlings raised on various diets, plus return rates of oil-dosed and control nestlings, will provide valuable information on the long term effects of prey composition and oil exposure for guillemot fitness.

In FY 2001, the final year of the study, nest boxes will be checked for recruitment of pigeon guillemots and return rates of banded chicks from 1998-1999 captive released cohorts will be examined. As well, data relating to the social attraction portion of the project will be written for peer-reviewed scientific journals. Results of the growth and oil dosing experiments will be written up as a Master's thesis and be submitted to peer-reviewed scientific journals.

NEED FOR THE PROJECT

A. Statement of Problem

In the last two decades the Pigeon Guillemot population in Prince William Sound has declined from 15,000 to 5,000 individuals (Laing and Klosiewski 1993). While this decline apparently began prior to the EVOS, an estimated 10-15% of the population in the spill area died as a direct result of the spill. Post-spill censuses have not detected an increase in numbers, suggesting no appreciable recovery has occurred in the aftermath of the spill. Reasons for the lack of recovery are unclear, but may be related to changes in prey resource availability, continuing exposure of guillemots or their prey to oil, or nesting failure due to predation on guillemot eggs and/or nestlings.

Predation on Pigeon Guillemot eggs and chicks was apparently minimal before EVOS, but post-spill studies have frequently recorded high levels of predation from river otters and mink (Hayes 1995). High predation rates could be reducing production of local birds, increasing breeding dispersal (lack of fidelity to a previously used nest site or location) of established breeders, and decreasing the immigration of guillemots from other colonies. While Pigeon Guillemots typically have high fidelity to their breeding site, disturbance and lack of breeding success can increase the rate and distance of breeding dispersal. Populations suffering high levels of disturbance, such as persistent nesting failure due to terrestrial predators, will decline due to a lack of production of new recruits, dispersal of breeding birds, and/or decreased immigration.

Two recent EVOS projects have identified potential reasons for a lack of recovery by Pigeon Guillemots in the EVOS area. The APEX Project has identified a major shift in the nearshore ecosystem that has apparently resulted in fewer high-lipid schooling fish, particularly sand lance (*Ammodytes hexapterus*) fed to chicks (Oakley and Kuletz 1994, Golet et al. unpubl. ms.). Pre-spill studies found sand lance, a nearshore schooling fish with relatively high average energy density, to be the dominant prey returned to chicks. Post-spill studies have found gadids and nearshore demersal fish to constitute the majority of the diet. The NVP project has attempted to determine if blood biomarkers can be used to monitor level of exposure to oil and if blood from individuals in wild populations currently indicates exposure to oil is occurring. Both of these projects have examined wild populations that are exposed to numerous sources of variability that confound the examination of factors affecting chick growth or blood biomarkers.

Dose-response experiments with guillemot nestlings fed small, sublethal amounts of weathered Prudhoe Bay crude oil may provide crucial validation and calibration results for interpretation of on-going and completed studies of biomarkers as indicators of crude oil exposure. Experimental studies with captive-reared guillemots will also provide a better understanding of how shifts in

the diet of guillemots and other seabirds breeding in the EVOS area affects growth, development, fledging condition, and, ultimately, fitness. By monitoring the growth and development of nestlings raised on controlled rations, the relative nutritional quality of various prey can be assessed. Also, fitness tradeoffs between prey size/quality and provisioning rate can be assessed through monitoring of subsequent survival in the wild of captive-reared chicks. Understanding the constraints imposed on guillemots by diet composition, oil exposure, and nest site quality will be crucial for designing management initiatives to enhance productivity in this and other seabird species that are failing to recover from EVOS.

B. Rationale/Link to Restoration

Artificial nest sites have the potential to increase the size of both guillemot breeding colonies and populations. A Black Guillemot colony in arctic Alaska increased from 10 to 225 pairs in 17 years through provision of artificial nest sites (Divoky et al. 1974 and in prep.). In Washington State 27% of the 33 Pigeon Guillemot colonies are in piers or other anthropogenic structures (Speich and Wahl 1989). Establishment of a Pigeon Guillemot colony near the Alaska SeaLife Center will demonstrate the utility of direct restoration in assisting the recovery of Pigeon Guillemot populations in the northern Gulf of Alaska. If artificial nest sites are successful in attracting breeding adults and if successful reproduction ensues, artificial nest sites can be used in Prince William Sound to enhance productivity, recruitment, and immigration, all of which will facilitate recovery. Clusters of artificial nest sites similar to those at the ASLC can be installed near natural colonies that suffer from chronically high nest predation rates. Nests could be placed on pilings or "dolphins" constructed specifically for colony development.

Aside from providing prototypes for artificial colonies in other parts of the EVOS area, a breeding colony of free-ranging guillemots at the ASLC will allow investigators to conduct research on Pigeon Guillemots that would not be possible at natural colonies. Loss of eggs or chicks to predation has been a major source of nest failure in post-spill studies of Pigeon Guillemots in Prince William Sound (Hayes 1995, Golet 1999). In addition, marked adults and returning young will allow an examination of demographics that has not been possible in Prince William Sound studies. A lack of recovery could be due to demographic parameters (e.g., adult survival, subadult survival, immigration/emigration rates) not evident in studies of nesting success or colony censuses. Guillemot demographics are much more easily studied at a colony of artificial nest sites where the banding of chicks and adults entails far fewer problems than at natural colonies. Should the proposed work result in the deployment and use of significant numbers of artificial nest sites in Prince William Sound, investigators will be able to obtain demographic information for that area that could explain the lack of recovery of local populations.

While the colonies of Pigeon Guillemots that we are attempting to established near the ASLC will have the benefit of captive-reared chicks returning to their natal location and assisting in establishment of the colony, immigration is obviously the source of adults founding new colonies. Immigrants can also be the primary source of recruits to established and expanding colonies (Petersen 1981). Unlike many seabirds, guillemots are semi-colonial and able to breed as single pairs as well as colonially. Prospecting guillemots can be expected to search for nesting opportunities more extensively than more colonial seabirds, which require minimum numbers of conspecifics for successful breeding. Nest sites at ASLC are likely to attract nonbreeding prospectors from the approximately 100 pairs of Pigeon Guillemots breeding between Aialik Cape and Cape Resurrection (Nishimoto and Rice 1987), as well as more distant colonies. An expanding colony of Black Guillemots in arctic Alaska drew most of its recruits from colonies more than 400 km distant (Divoky, in prep.).

A Pigeon Guillemot colony could also have the potential of attracting other seabird species to nest in the area of ASLC. Some of these other species may also be recruited by providing nest sites. A Black Guillemot breeding colony that utilized artificial nest sites in arctic Alaska also attracted Horned Puffins (*Fratercula corniculata*), some of which used the artificial nest sites (Divoky 1982 and unpubl.).

The research component of this study will allow evaluation and validation of the use of nondestructive biomarkers (in blood and excreta) to assess the health status of individual guillemots and potential exposure to petroleum hydrocarbons. There is evidence that certain acute phase proteins (i.e., haptoglobin) in blood and porphyrins in excreta are induced by ingestion of sublethal doses of weathered crude oil (Prichard et al. 1997). The results of a dose-response experiment with wild guillemot nestlings in their natural nest sites, however, were ambiguous because of among-site variability in baseline values for biomarkers (Prichard et al. 1997). Also, guillemot nestlings were fed small doses (0.05-0.2 ml) of highly weathered PBCO in that study; and the dose levels were not sufficient to cause even a significant decline in growth rates of nestlings. Finally, blood samples for measuring biomarker levels were not collected until five days post-dosing, when any induction of an acute phase response had already likely peaked. Regardless of all these uncontrolled factors, the serum haptoglobin levels in guillemot chicks fed 0.2 ml of weathered PBCO were significantly different from that of controls. While the use of blood and fecal biomarkers for monitoring oil exposure and general population health of guillemots is promising, more research under controlled, captive conditions is required to validate the techniques and provide a sound basis for interpretation of results from wild guillemots.

There is a need for information on the relationship between diet and reproductive success for Pigeon Guillemots, a seabird species that is failing to recover from EVOS at an acceptable rate. Guillemots are the most neritic members of the marine bird family Alcidae (i.e., murres, puffins, and auks), and like the other members of the family, capture prey during pursuit-dives. Pigeon Guillemots prey on a wide variety of fishes, including schooling forage fish (e.g., sand lance, herring, pollock) and subtidal/nearshore demersal fish (e.g., gunnels, blennies, sculpins; Drent 1965, Kuletz 1983). There is strong evidence of a major shift in diet composition of guillemot pairs breeding at Naked Island. Sand lance were the predominant prey fed to young in the late 1970s (Kuletz 1983), but currently sand lance is a minor component of the diet (G. Golet, unpubl. ms.). In contrast, guillemots breeding in Kachemak Bay continued to provision their young predominately with sand lance up through the 1996 breeding season, and sand lance was particularly prevalent in the diet at sites that support high densities of breeding pairs (Prichard 1997). Also, young of breeding pairs that provisioned their nestlings with mostly sand lance had higher growth rates (Prichard 1997, Golet et al. unpubl. ms.). Jackpot Island in southwestern Prince William Sound supports the highest nesting densities of guillemots anywhere in the Sound and growth rates of nestlings are correspondingly high. The high availability of juvenile herring to guillemots nesting at Jackpot Island may be responsible for both the high nesting density and high growth rates. Thus availability of high-quality schooling forage fishes (herring, sand lance) may be crucial for maintaining high nesting densities of guillemots.

C. Location

All captive rearing studies will be completed by FY 00. Guillemot eggs and hatchlings (<10 days post-hatch) were obtained from source colonies on the Kenai Peninsula, Kodiak Island, non-oiled parts of Prince William Sound, Southeast Alaska, or at other appropriate northern Gulf of Alaska colonies. The impact of these collections on the productivity of source colonies should have been negligible, as eggs lost during the first half of incubation are usually replaced during renesting and the majority of guillemot nesting attempts in the NGOA fail to produce fledglings because of high nest predation rates (see annual progress reports for EVOS Trustee Council projects 163F and 163M). All the captive-reared chicks that reach fledgling age in good health will be banded and released at ASLC to assist in efforts to establish local breeding colonies of free-ranging guillemots near ASLC. Artificial nest sites will be maintained near ASLC on an adjacent breakwater and other sites to enhance the prospects for colony establishment. Colonies in Resurrection Bay that may serve as sources of immigrants or may recruit captive-reared guillemots will be censused and checked for banded adults during the final year of the project, 2001 Other nesting platforms will be checked for recruitment of guillemots, as well. The information obtained from this project will benefit Pigeon Guillemot populations in the Gulf of

Alaska, especially Prince William Sound. An understanding of the affect of prey type on chick growth will help explain the role of ecosystem shifts in continuing declines of Pigeon Guillemot populations. Assessing the utility of blood biomarkers for detecting and quantifying exposure to crude oil will benefit efforts to monitor the health status of Pigeon Guillemot populations throughout the spill zone without resort to lethal sampling procedures.

Laboratory analysis, including proximate composition analysis of fish will continue at Oregon State University. Scott Newman at UC-Davis, will aid in the analysis of blood biomarkers. Further assistance will be achieved using Alexander Kitayski at the University of Washington to examine the role of corticosterones in stress of dosed vs. undosed birds. Larry Duffy of the University of Alaska-Fairbanks may also aid in examination of haptoglobin induction in blood.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

All research will be conducted at the Alaska SeaLife Center, which will allow the community in and around Seward to observe progress in the establishment of guillemot colonies in both artificial and natural nest sites. Wild breeding colonies near ASLC have the potential for involving science classes from local schools. The location of colonies will potentially permit easy viewing by the public and allow science teachers to use the colony for instruction about seabird breeding biology and restoration. Science classes could conduct observations on the occurrence and activities of prospecting and breeding guillemots. Some of these (timing of arrival in the spring and sightings of color banded adults) could provide important information for the period when the investigators are not in Seward. Local science teachers can receive annual summaries of information about local colonies (e.g., timing of clutch initiation, breeding success) that can provide the basis for lessons on regional climate change and annual variability in the marine environment. The Seaquest Program of the Chugach School System would be a logical avenue for presenting this material to students.

PROJECT DESIGN

A. Objectives

Dr. George Divoky will undertake Objective 1:
1. Determine the feasibility of using direct techniques for restoration of Pigeon Guillemots, including:
   a) providing artificial nest sites
   b) use of social attraction, such as decoys and playbacks of vocalizations
   c) checking for recruitment of breeding adults to established artificial nest sites
   d) monitoring recruitment of chicks fledged from the SeaLife Center from 1998-1999 in colonies in Resurrection Bay and at the artificial nest sites at the SeaLife Center

Dr. Dan Roby will undertake Objectives 2 and 3:
This portion of the research project has the two primary objectives listed below. During the final year of the project (FY 01), the emphasis will be on interpreting data related to both objectives 2 and 3.

2. Determine the response of particular biomarkers of crude oil exposure (acute phase proteins, plasma sodium, corticosterone, fecal porphyrins) to variables of exposure in guillemot nestlings, and the survival of exposed nestlings post-fledging. Exposure variables that will be examined include:
   a) dose of ingested oil
   b) degree of weathering of ingested oil
   c) time since ingestion of dose
   d) number of previous exposures

2. Determine the effect of diet variables on growth performance, development, fledging condition, and post-fledging survival of Pigeon Guillemots, including:

a) type of forage fish consumed, with emphasis on high-lipid forage fishes vs. low-lipid fishes
b) lipid content of the diet
c) size of prey items
d) frequency of prey delivery

B. Methods

The partially completed (objective 1) and completed work (objective 2 and 3) will test the following three basic hypotheses, which relate to each of the three primary objectives listed above:

Hypothesis 1. Artificial nest sites, decoys, and playbacks of vocalizations can be used to establish new Pigeon Guillemot breeding colonies and enhance breeding success over that experienced at natural colonies using natural nest sites.

Hypothesis 2. Biomarkers from plasma and excreta of nestling Pigeon Guillemots can be used as indicators of exposure to weathered crude oil in the food supply, and the subsequent survival probabilities of young guillemots post-fledging.

Hypothesis 3. Growth performance, fledgling condition, and post-fledging survival of Pigeon Guillemot nestlings are sensitive to differences in prey type, prey size, feeding frequency, and lipid content of prey.

Methodology employed during the third year of the study (FY 00) will consist of the following:

Objective 1: Testing Feasibility of Direct Restoration Techniques

Dr. George Divoky

a. Installation of Artificial Nest Sites and Use of Social Attraction

Pigeon Guillemot nest sites have been constructed and installed at several locations in the vicinity of the Alaska SeaLife Center. Additional nest sites will be provided at each location if the number of breeding birds and prospecting adults exceeds the number of available nest sites. Design of the artificial nest sites was based on the sites developed by Dr. Divoky for Pigeon Guillemots in Puget Sound, with modifications based on studies of nest site characteristics that were associated with nesting success in Kachemak Bay (Prichard 1997). Sites have two entrances with a central nesting cavity. Baffles in the entryways to the nest cavity prevent avian predators from viewing nest contents. Based on the locations of Pigeon Guillemot nest sites associated with docks and piers, it appears that placing the sites beneath an overhang will increase their attractiveness to guillemots prospecting for nest sites. Sites under an overhang apparently have the advantage of decreased avian predation. Sites are large enough to accommodate monitoring devices (such as a closed circuit camera, platform scale, or activity monitor) that may be used in future research.

Guillemot decoys have been made from molds produced by Mad River Decoy in Vermont. A CD player with external speakers was used to play adult Pigeon Guillemot calls from May to mid August. Because prospectors may make recruitment decisions based on local breeding productivity (Boulinier et al. 1996), from late June to late August the calls of chicks in nest sites were also be played during the early morning and evening, when colony attendance can be expected to be highest. Similar combinations of decoys and audio playbacks have been used

successfully for other seabird species, including alcids (Kress and Nettleship 1989, Kress 1983), but have never before been used to attract guillemots to nest at new locations.

We will begin systematic observations of artificial nest sites and decoy sets in May. Daily observations will be conducted at the times expected to have maximum colony attendance (0600-0900 and 1600-2000 Alaska Daylight Time, high tides). Initially observations will be recorded every 15 minutes on the number of Pigeon Guillemots visible from the roof of ASLC and their distance from artificial nest sites. Once guillemots begin associating with decoys and nest sites, we will conduct detailed observations on the behavior of prospecting birds. The location and activities of prospectors will be recorded during 15-minute periods. Behavioral observations will be similar to those conducted by Preston (1968) on Black Guillemot social behavior.

b. Monitoring of Pigeon Guillemot Breeding Biology and Demographics

Should breeding occur in the artificial nest sites in 2001, we will obtain information on the breeding biology of birds using the nest sites. To reduce the chances of nest site abandonment, no adults will be captured during 1999, but if successful breeding takes place in 2000, we will attempt to noose breeding adults for banding in 2001. In 2001 the following breeding parameters will be monitored:

o date of clutch initiation
o egg weight and volume
o egg color and pattern
o date of hatching
o weight at hatching
o hatching success
o growth rate (measured every two-four days)
o fledging weight
o fledging age
o fledging success

The observations on breeding chronology and success can be compared with the recently completed monitoring of Pigeon Guillemot nesting in Prince William Sound and Kachemak Bay. Additionally the information on egg size and color can be used in future years to assess the potential of using egg characteristics to measure female survival and recruitment.

During the nestling period we will conduct observations on the prey types delivered to chicks. These observations will determine the taxonomic composition of nestling diets at each nest and collectively. These observations will be compared with diet data collected at natural colonies in Prince William Sound and Kachemak Bay (Golet unpubl. ms., Prichard 1997).

c. Recruitment of captively-reared pigeon guillemots.

We will attempt to locate guillemots that were raised at the Alaska SeaLife Center at regional colonies during our surveys. Resightings of banded guillemots from the ASLC will provide information on survival (by both year and experimental group) and dispersal distance for this species. Intercolony visits are common for pre-breeding alcids (Harris 1983, Kress and Nettleship 1989), and in 2001 we will search these colonies for banded individuals that were raised in captivity at ASLC in 1998 and 1999. Additionally, any recruits at the artificial nest sites at the ASLC will be monitored in the same way as above.

Objective 2. Validation and Calibration of Nondestructive Biomarkers for Monitoring the Health and Exposure to Oil of Guillemots
Dr. Dan Roby

We will be interpreting data relating to this objective in 2001.

a. Measurement of Certain Blood Biomarkers of Petroleum Hydrocarbon Exposure

In the third year of this study (FY 00), research on blood biomarkers of oil exposure will include controlled dose-response experiments with weathered PBCO. A range finding experiment will be conducted to determine the no-effect dose for guillemot chicks consuming weathered PBCO. We will also determine the time course of biomarker response to ingestion of PBCO, including the time post-ingestion when biomarker induction is no longer detectable. At days 15-25 post-hatch, we will feed guillemot chicks small, sublethal doses of weathered PBCO in number 2 gelcaps that are inserted into the abdominal cavity of a fish that is then fed to the nestling. Eight guillemot nestlings raised on herring (see below) will be assigned to each of the following oil ingestion treatments: control, 1.0 ml (total) of weathered PBCO, and 2.0 ml (total) of weathered PBCO. Control chicks will receive 1 ml (total) of corn oil in a number 2 gelcap inserted in a food fish. We know from previous experiments (Prichard et al. 1997) that a dose of 0.2 ml of weathered PBCO ingested three times during the latter part of the nestling development period does not have a significant effect on growth of Pigeon Guillemots. Consequently, these doses are designed to identify the "no-effect" dose for weathered PBCO.

Just before and following ingestion of the oil dose, we will collect 0.8 ml of blood in heparinized vials by puncturing the tarsal vein. Blood samples will be collected at 0 days, 2 days, 5 days, and 10 days after the initial day of ingestion of oil. Blood samples will be kept cool and centrifuged at 3,000 rpm for 20 minutes. Plasma will then be removed with a pipette and stored in snap-top plastic vials at -20°C for laboratory analysis at the University of California Davis and the University of Washington. In the lab, we will measure haptoglobin and other acute phase protein levels in plasma samples in order to determine dose-response and time course of the response. Assays for blood biomarkers will be conducted in the laboratory of Dr. Scott Neuman at UC Davis. Blood biomarker levels will be compared among the control chicks raised on the three diets (see below) to assess the role of diet in determining baseline biomarker levels, relative to induction caused by ingestion of PBCO. Levels of corticosterones, measuring general stress levels, will be assayed in the lab of Alexander Kitayski at the University of Washington.

b. Measurement of Biomarkers in Excreta

In addition to collection of blood samples, samples of excreta will be collected over 24-h intervals each day after the intitial dosing of PBCO in order to measure fecal porphyrin levels and determine dose-response and time course of response. As with blood biomarkers, responses in fecal porphyrin levels will be compared among the three diet groups. Measurements of fecal porphyrins in excreta will be conducted in the laboratory of Dr. Larry Duffy at the University of Alaska Fairbanks.

Objective 3. Captive Feeding Trials to Assess the Relationship between Diet and Postnatal Development in Guillemots
Dr. Dan Roby

We will be interpreting data relating to this objectives in 2001.

a. Comparison of Guillemot Growth Performance on Diets of High-lipid or Low-lipid Schooling Forage Fish

In FY 00, 8-12 guillemot chicks will be raised on each of two diets: (1) 160 g of herring per day, or (2) 160 g of juvenile walleye pollock per day. These prey species are major components of guillemot chick diets at certain sites and the three species are representative of the two very different lipid levels in guillemot prey. These daily rations are designed so as to provide a variety of caloric and lipid consumption rates that are within the normal range experienced by guillemot nestlings, but biomass consumption rates would be the same for each diet group. Herring and sand lance are representative of high-lipid forage fishes with relatively high energy densities.

Juvenile walleye pollock are representative of low-lipid forage fishes with relatively low energy densities. Each chick will be kept in a separate cage so that food consumption can be monitored individually. The daily rations will be provided to most chicks in four daily feedings of 40 g each at approximately 8:00, 11:00, 15:00, and 19:00 ADT. Each day prior to the first feeding the body mass and wing length of each chick will be measured until each captive-reared chick fledges into the wild, at about 35-40 days post-hatch. Return rates of subadults in this final year of this study will allow us to assess the role of prefledging nutrition and fledging mass on subsequent post-fledging survival.

Approval of the field protocols for work with live birds described in this DPD have been obtained from the Institutional Animal Care and Use Committee at Oregon State University and from ASLC. Any take of eggs or incidental/unintentional take of nestling or adult guillemots will be covered by relevant Federal and State Scientific Collecting permits. All fledgling, captive-reared guillemots released to the wild were banded with USFWS stainless steel leg bands and polyvinyl colored leg bands under a Master Station banding permit held by the Oregon Cooperative Fish and Wildlife Research Unit.

C. Contracts and Other Agency Assistance

Laboratory analyses of the biochemical composition and energy content of forage fishes fed to captive guillemots will be conducted in the laboratory of the PI at Oregon State University.

Analyses of biomarkers in blood plasma and fecal samples will be conducted in the labs of Dr. Scott Newman at the University of California Davis, Dr. Lawrence K. Duffy at the University of Alaska Fairbanks, and Dr. Alexander Kitayski at the University of Washington, where the expertise is available to perform these tasks.

SCHEDULE

A. Measurable Project Tasks for FY 01 (February 1, 2001 - January 31, 2002

Feb. 1-March 15:	Analysis and interpretation of field data from captive-reared chicks. Complete laboratory analyses of plasma samples and diet samples.
January 1 - 14:	Prepare for Annual Restoration Workshop.
January 15 - 24:	Attend Annual Restoration Workshop and present FY 00 results to peer reviewers.
Jan. 24 - April 14:	Prepare 2000 annual report of findings.
March 15-Jun 30. :	Preparation and completion of M. S. thesis.
May 1 - May 15:	Install artificial nest sites, decoys, and playback sound equipment at SeaLife Center.
May 15-Aug. 15	Periodic surveys and monitoring for pigeon guillemot recruitment.
March 15-Jan. 31:	Completion and submission of manuscripts addressing objectives.
Dec. 15:	Submit final annual report (FY 01 findings).

B. Project Milestones and Endpoints

FY 01

March 15, 2001:	Completion of laboratory analysis and data interpretation.
May 15, 2001	Final installation of audio playback equipment at ASLC.
Dec. 15, 2001:	Completion of fourth annual report of findings.
June 30, 2001:	Completion of M.S. thesis.
January 31, 2002:	Submission of manuscripts addressing objectives 1 and 2.

C. Completion Date

The anticipated completion of this project will be early in FY 02, at the end of calendar year 2001. This will allow adequate time to complete data analysis, thesis preparation by the Masters student, and manuscript preparation and submission following the last field seasons in 2000 (Objectives 2 and 3)and 2001 (Objective 1) and completion of laboratory analysis early in 2001.

PUBLICATIONS AND PROJECT REPORTS

The following publications are projected for this research project (this is a rough projection and by no means complete):

An annual report for the third year of this project will be submitted by 15 April 2001. The final report for this project will be submitted 15 December 2001. At least three manuscripts will be generated from this research, and all will be published in the peer-reviewed scientific literature. Each of these three manuscripts will address one of the three major objectives/hypotheses of this study: (1) guillemot colony establishment as a direct restoration technique, (2) biomarkers as a means of assessing exposure of guillemots to crude oil, and (3) diet as a factor in nestling growth and post-fledging survival. A portion of the final report will be excerpted from the thesis of the M.S. student on this project. This student, as first author, will be strongly encouraged and directly assisted by the PI to submit for publication in the peer-reviewed scientific literature the results from this research on objectives 2 and 3. Dr. Divoky will be first author on manuscripts relating to objective 1.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

The research described in this proposal takes advantage of the new research facilities and potential represented by the Alaska SeaLife Center and dove-tails nicely with continuing research as part of the APEX and NVP projects that assesses factors limiting recovery of Pigeon Guillemot populations damaged by EVOS. It is also relevant to efforts toward developing seabird models as upper trophic level sentinels of oil pollution in nearshore ecosystems. The proposed research approach utilizes growth performance, fledgling body condition, and blood and fecal biomarkers to assess the health status of guillemot nestling exposed to oil and raised on different diet rations. These data are essential for developing techniques for long term monitoring of the health and status of guillemot populations in the EVOS area.

Studies of foraging, reproduction, and population recovery following the EVOS are on-going for pigeon guillemots. This proposal complements and enhances other studies on pigeon guillemots, without duplication of effort. The PI on the present proposal has been and will continue to work closely with David Irons and Greg Golet (PIs on APEX Component 00163 F "Factors Affecting Recovery of PWS Pigeon Guillemot Populations"), Dave McGuire (Co-PI on NVP studies of biomarkers of oil exposure in guillemot nestlings), and John Piatt (PI on APEX Components 00163 M "Lower Cook Inlet Forage Fish Studies" and 99163 N "Black-legged Kittiwake Feeding Experiment") in developing protocols for collecting data.

PRINCIPAL INVESTIGATORS

Objective 1
George J. Divoky
Research Associate, Institute of Arctic Biology, UAF
4505 University Way NE #71
Seattle, WA 98105
tel: 206-365-6009
fax: 206-368-8941
e-mail: fngjd@uaf.edu

George Divoky is a Postdoctoral Research Associate who has more than 20 years of research experience with guillemots and has been instrumental in designing techniques for direct restoration of guillemot populations.

Objectives 2 and 3
Daniel D. Roby
Oregon Cooperative Fish and Wildlife Research Unit
Department of Fisheries and Wildlife
104 Nash Hall
Oregon State University
Corvallis, Oregon 97331-3803
tel: 541-737-1955
fax: 541-737-3590
e-mail: robyd@ucs.orst.edu

Dan Roby has extensive experience with studies of the reproductive biology of high latitude seabirds and the relationship between diet composition and productivity. He is currently the PI of the Seabird Energetics component (Component G) of the APEX Project and Co-PI of the Diet Quality and Chick Growth component (Component N) of the APEX Project. He has been involved in research on the factors constraining recovery of Pigeon Guillemots in the EVOS area for the last four years.

OTHER KEY PERSONNEL

The proposed research will be implemented by the Oregon Cooperative Fish and Wildlife Research Unit. It will be closely coordinated with and in cooperation with personnel of the Alaska SeaLife Center in Seward. Dr. Divoky will be assisted by a research assistant on objective 1. Dr. Roby will be assisted on objective 2 and 3 experiments with captive-reared chicks by Dr. Andrew Hovey, a graduate student in the Department of Fisheries and Wildlife at Oregon State University, a research assistant and two interns. Laboratory analyses of the proximate composition of diet samples will be conducted in the laboratory of Dr. Roby at Oregon State University. Assays of plasma and fecal biomarkers will be conducted in the laboratories of Drs. Scott Newman (UC Davis), Lawrence Duffy (University of Alaska Fairbanks), and Alexander Kitayski (University of Washington). To the PI's knowledge, the expertise and equipment necessary for the proposed research are not available within the federal and state agencies that comprise the Trustees Council.

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Revision 7-7-00
Approved TC 8-3-00

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001
Personnel		$0.0
Travel		$0.0
Contractual	$161.1	$81.2
Commodities		$0.0
Equipment		$0.0
Subtotal	$161.1	$81.2
General Administration	$11.3	$5.7
Project Total	$172.4	$86.9
Full-time Equivalents (FTE)	1.3	1.3

LONG RANGE FUNDING REQUIREMENTS					
		Estimated Fy 2002	Estimated FY 2003		
		$0.0	$0.0		

Dollar amounts are shown in thousands of dollars.

Other Resources

Comments:

FY01

prepared 7/7/00

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska SeaLife Center
Agency: DOI: U.S. Geological Survey

FORM 3A
TRUSTEE
AGENCY
SUMMARY

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2000
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		0.0	0.0	0.0	
					Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2000
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey

FORM 3B
Personnel
& Travel
DETAIL

Contractual Costs:	Proposed FY 2000
Description	
4A Linkage: Roby contract	59.1
4A Linkage: Divoky contract	22.1
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$81.2

Commodities Costs:	Proposed FY 2000
Description	
Commodities Total	$0.0

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey

FORM 3B
Contractual & Commodities DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2000
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey

FORM 3B
Equipment
DETAIL

2001 EXXON VALDEZ TRUS COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 1999	Proposed FY 2000
Personnel		$28.8
Travel		$2.3
Contractual		$14.5
Commodities		$0.0
Equipment		$0.0
Subtotal	$0.0	$45.6
Indirect		$13.5
Project Total	$0.0	$59.1
Full-time Equivalents (FTE)		1.0
Other Resources		

LONG RANGE FUNDING REQUIREMENTS

Estimated FY2002	Estimated FY2003
$0.0	$0.0

Dollar amounts are shown in thousands of dollars.

Comments:

Indirect rate for OSU in FY00 is 43% of Modified Total Direct Cost (MTDC=Direct cost- assistanceship and equipment) on-campus research rate and 26% of MTDC off-campus research rate.

Indirect rate: $12,049 + $2,781 = $13,476

1. FY00 On-Campus direct costs=$34,329, which includes office salaries, benefits, meeting travel, office support. FY00 Modified direct costs (less tuition, equipment)= $28,021

43% of $28,021= $12,049

2. FY00 Off-campus direct costs= $10,695, which includes field salaries, benefits, field travel, and field housing. FY00 Modified direct costs (less tuition, equipment)= $10,695

26% of $10,695= $2,781

Not included in this budget are bench fees for the Alaska SeaLife Center

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey: Roby contract

FORM 4A
Non-Trustee
SUMMARY

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:			Months	Monthly		Proposed
Name	Position Description		Budgeted	Costs	Overtime	FY 2000
graduate research assistant			12.0	2.4		28.8
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		12.0	2.4	0.0	
					Personnel Total	$28.8

Travel Costs:		Ticket	Round	Total	Daily	Proposed
Description		Price	Trips	Days	Per Diem	FY 2000
						0.0
					0.0	0.0
						0.0
EVOS Annual Restoration Workshop	$120/day	0.6	1	3	0.1	1.0
PI meetings in Anchorage		0.6	1	6	0.1	1.3
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$2.3

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey: Roby contract

FORM 4B
Personnel
& Travel
DETAIL

2001 EXXON VALDEZ TRU : COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Contractual Costs:	Proposed FY 2000
Description	
	0.0
	0.0
duplication/computer fees	1.0
lab analyses of blood & excreta samples for biomarkers	10.0
(S. Newman, UC-Davis; A. Kitayski, UW; L. Duffy, UAF; acute phase porteins in blood, fecal poryphrins)	
publication- reports and visual aids	1.5
shipping for samples	0.5
phone services- long distance charges	1.5
Contractual Total	$14.5

Commodities Costs:	Proposed FY 2000
Description	
	0.0
	0.0
	0.0
	0.0
	0.0
	0.0
	0.0
	0.0
Commodities Total	$0.0

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey: Roby contract

FORM 4B
Contractual & Commodities DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2000
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage: Description	Number of Units	

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey: Roby contract

FORM 4B
Equipment
DETAIL

2001 EXXON VALDEZ TRU[redacted]E COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 1999	Proposed FY 2000
Personnel		$14.3
Travel		$5.4
Contractual		$2.4
Commodities		$0.0
Equipment		$0.0
Subtotal	$0.0	$22.1
Indirect		$0.0
Project Total	$0.0	$22.1
Full-time Equivalents (FTE)		

LONG RANGE FUNDING REQUIREMENTS					
		Estimated FY 2001	Estimated FY 2002		

Dollar amounts are shown in thousands of dollars.

Other Resources								

Comments:

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey: Divoky contract

FORM 4A
Non-Trustee
SUMMARY

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Personnel Costs:			Months	Monthly		Proposed
Name	Position Description		Budgeted	Costs	Overtime	FY 2000
Dr. George Divoky			2.5	4.5		11.3
Research Assistant			1.5	2.0		3.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		4.0	6.5	0.0	
					Personnel Total	$14.3

Travel Costs:		Ticket	Round	Total	Daily	Proposed
Description		Price	Trips	Days	Per Diem	FY 2000
Seattle, WA to Seward SeaLife Center		0.7	2			1.4
Seward, AK to nest sites to check occupation						4.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$5.4

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey: Divoky contract

FORM 4B
Personnel
& Travel
DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Contractual Costs:	Proposed
Description	FY 2000
	0.0
Skiff rental for surveys in Resurrection Bay	1.0
Duplication/computer fees	0.2
Publication - reports, visual aids	0.1
Vehicle rental	0.5
Telephone services--long distance charges	0.1
Housing in Seward	0.5
Contractual Total	$2.4

Commodities Costs:	Proposed
Description	FY 2000
	0.0
	0.0
	0.0
	0.0
	0.0
Commodities Total	$0.0

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey: Divoky contract

FORM 4B
Contractual & Commodities DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2000
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage: Description	Number of Units	

FY01

Project Number: 01327
Project Title: Pigeon Guillemot Restoration Research at the Alaska Sealife Center
Agency: DOI: U.S. Geological Survey: Divoky contract

FORM 4B
Equipment
DETAIL

Approved TC 8-3-00

Survival of Adult Murres and Kittiwakes in Relation to Forage Fish Abundance

Project Number:	01338
Restoration Category:	Research
Proposed By:	U.S. Geological Survey (PI- John F. Piatt)
Lead Trustee Agency:	DOI-USGS
Cooperating Agencies:	DOI-FWS
Alaska SeaLife Center	no
Duration:	4th year, 4-year project
Cost FY 01:	$47,200
Cost FY 02	$0
Geographic Area:	Cook Inlet, Gulf of Alaska
Injured Resource:	Multiple resources

ABSTRACT

Some seabird populations damaged by the *Exxon Valdez* oil spill continue to decline or are not recovering. In order to understand the ultimate cause of seabird population fluctuations, we must measure productivity, recruitment, and adult survival. Recent APEX studies focused on measuring productivity only. Recruitment measurement demands an unrealistic study duration. We propose to augment current studies in lower Cook Inlet that relate breeding success and foraging effort to fluctuations in forage fish density by using banding and resighting to quantify the survival of adult common murres and black-legged kittiwakes.

INTRODUCTION

Some seabird populations in the Gulf of Alaska have undergone marked fluctuations during the past few decades (Hatch and Piatt 1995; Piatt and Anderson 1996), including periods of decline or non-recovery. Ultimately, the ability of injured or declining seabird populations to recover depends on: 1) breeding success, or productivity; 2) fledgling survival and subsequent recruitment; and 3) overwinter survival of adults (Harris and Wanless 1988). Without concurrent measurement of at least two of these three parameters, it is difficult to determine which factor is most limiting to a population's recovery.

Mechanisms that regulate seabird populations by influencing productivity, recruitment, and adult survival are poorly understood, but food supply is clearly important (Cairns 1992). Studies sponsored by the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) in 1995-99 (APEX, Restoration Project 00163) have shown linkages between food supply and population fluctuations. Exactly which parameters of reproductive strategy are driven by food supply, and so drive population fluctuations, remain unclear. To date, APEX has focused on forage fish availability and its relationship to energy expenditure and productivity.

We are determining the overwinter survival of adult common murres (*Uria aalge*) and black-legged kittiwakes (*Rissa tridactyla*) using established banding and resighting techniques at two of the colonies investigated under APEX. Results of past work show clear differences in prey availability between the two colonies, with forage fish being scarce around Chisik Island and abundant around Gull Island. Both seabird species must work significantly harder at Chisik to provide food to their chicks. This difference appears to be manifested in sharply reduced kittiwake production at Chisik Island. Observing that kittiwake populations have been steadily declining at Chisik while increasing at Gull, one might be tempted to conclude that weak productivity and recruitment are driving the Chisik kittiwake population declines. However, while murres (at least in recent years) have been similarly productive at Chisik and Gull, the Chisik Island murre population has historically declined at an even greater rate than the kittiwake population.

From these data we conclude that the murre population decline at Chisik Island and concurrent increase at Gull Island may be attributable to differences in adult survival rates. Measurement of survival rates, in coordination with APEX's focus on food supply, energy expenditure and colony productivity, should help to more completely resolve the mechanisms underlying seabird population fluctuations, particularly for those species such as murres that are able to buffer against periods of food shortage by increasing foraging effort (Burger and Piatt 1990; Irons 1992).

Our continued research will measure adult survival of both murres and kittiwakes at Chisik and Gull Islands. We will use conventional banding/resighting methods to establish both species' adult survival rates. Working in collaboration with the Cook Inlet Seabird and Forage Fish Studies (CISeaFFS) component of the APEX project, we will compare survival between colonies

in relation to foraging stress, breeding success, and forage fish abundance as determined during APEX surveys in 1995-1999. Foraging stress from breeding effort is probably a major contributor to adult overwinter mortality (Golet et al. 1998). Our work will enhance understanding of the relationships among survival, reproduction; and foraging energy expenditure in kittiwakes and murres in lower Cook Inlet. In a broader context, our research will clarify the mechanisms and limiting parameters underlying natural population declines or the failure of injured populations to recover.

NEED FOR THE PROJECT

A. Statement of the Problem

Research has provided few clear examples of how seabird population biology is affected by changes in prey availability (Hunt et al. 1991). Consequently, it has been difficult to understand the non-recovery of some EVOS-damaged seabird populations because natural changes in forage fish stocks may have also contributed to their decline. The picture is further complicated by our inability to pinpoint which aspect of population biology ultimately drives population fluctuations. To determine the cause of population declines or non-recovery, the population's productivity, recruitment, and adult survival should be measured concurrent with evaluation of available food supply (Cairns 1992).

Recent EVOSTC-funded work (APEX, Restoration Project 00163M) measured productivity and foraging differences of seabirds in response to fluctuating prey availability. Results from research conducted in lower Cook Inlet show a correspondence between kittiwake productivity and forage fish availability to breeders. There is no correspondence, however, in species such as the murre which are able to increase foraging effort in response to decreasing forage fish abundance (Burger and Piatt 1990, Zador and Piatt 1999). Differences in recruitment and/or adult survival are thus implicated as important determinants of population fluctuations. Yet their relative importance has not been established by EVOSTC researchers, despite past work which has shown that variation in either recruitment or adult survival could obscure or even offset population fluctuations apparently driven by productivity differences (Hudson 1985).

Since murres and kittiwakes do not commence breeding until they are several years old (Hudson 1985; Aebischer and Coulson 1990), it is not feasible to measure recruitment in Cook Inlet seabird populations within the time frame required by EVOSTC funding. Measurement of adult overwinter survival has not yet been studied within a complete ecological framework, and has been identified by APEX reviewers as an important topic for expanded research in pursuit of understanding population fluctuations and recovery.

B. Rationale

Population changes are continually being driven by natural ecosystem changes, and are occasionally driven by anthropogenic perturbations such as the *Exxon Valdez* oil spill. In order to separate natural population fluctuations from anthropogenic population changes, we must have a complete understanding not only of the factors which drive population changes (e.g. change in prey availability) but also of the population biology parameter which is most altered by those driving forces. Annual productivity in relation to varying prey availability has been studied, but cannot explain all observed population trends. It is not feasible to measure chick survival and recruitment. Therefore, to assess the potential for recovery of seabirds affected by the spill by pinpointing the cause of population trends, a study of adult survival and its relationship to prey availability is required.

In collaboration with the ecosystem-based study of seabird foraging conditions and breeding biology conducted by APEX in lower Cook Inlet (Restoration Project 00163M), we have a unique opportunity to assess not only the role of adult survival in seabird population fluctuations, but also the suspected linkage between foraging effort during the breeding season and adult overwinter survival. By choosing species with different long-term breeding strategies (kittiwakes maintain investment in reproduction at relatively constant [high] levels despite variation in food supply; murres adjust reproductive effort in relation to prey availability by altering buffer or "loafing" time) we will address questions raised by APEX work that shows linkage between prey availability and population fluctuation in some species (kittiwake) but only implies a linkage in others (murre). Refined understanding of foraging effort in relation to food supply will further our understanding of the costs of breeding in murres and kittiwakes. Stress induced by increased foraging effort in response to poor foraging conditions (Kitaysky et al. 1999a) may explain variation in adult survival.

C. Location

The proposed research will be undertaken in lower Cook Inlet, Alaska. The project's benefits will be realized throughout the EVOS area, in the form of enhanced understanding of seabird population trends and recovery mechanisms. Homer, Alaska is the only community that may be directly affected by the proposed research (as detailed below).

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

Gull Island in Kachemak Bay is owned by the Seldovia Native Association (SNA). Limited subsistence use occurs during summer, with occasional egging and harvesting of juvenile birds (Fred Elvsaas, pers. comm.). It is also a major tourist attraction for visitors to Homer. Permission to work on and around the island has been obtained under the provision that annual reports of findings be made available to the SNA. We inform the local tour boat operators about our activities so that our presence at the island can be explained to visiting tourists. Chisik Island

is managed by the Alaska Maritime National Wildlife Refuge, and we will employ charter vessels from Homer to support field work there. Chisik Island supports a small, seasonal fishing community and we will inform the summer residents about the nature and purpose of our activities. Whenever possible, equipment and other resources will be acquired locally.

PROJECT DESIGN

A. Objectives

1. To determine adult common murre and black-legged kittiwake overwinter survival rates, using conventional banding and resighting methods.

2. To relate differences in common murre and black-legged kittiwake overwinter survival to differences in prey availability, foraging effort and physiological stress during the breeding season.

3. To relate differences in common murre and black-legged kittiwake overwinter survival to differences in breeding success.

Background

We will conduct the proposed research at Chisik and Gull Islands, in lower Cook Inlet. Chisik Island has relatively low prey availability within typical murre/kittiwake foraging ranges, while Gull Island has high prey availability. The Chisik Island populations of both murres and kittiwakes have shown steady declines over the past two decades, in contrast to the Gull Island populations which are expanding. Recent APEX work has shown a significant relationship between breeding success and foraging effort for kittiwakes, but not for murres. Both species show increased foraging effort with decreased prey availability, but it appears that murres have a greater range of foraging effort within which they can still successfully produce chicks, as indicated by past studies (Burger and Piatt 1990, Zador and Piatt 1999). This raises the question: Is there a delayed or hidden cost to successful breeders that have had to "work harder" to raise their chicks? One way such a cost may be expressed is in decreased annual adult survival.

Measurement of survival:

Adult overwinter survival in seabirds has typically been measured by intensive banding and resighting programs (Harris and Wanless 1988; Aebischer and Coulson 1990; Hatchwell and Birkhead 1991; Hatch et al. 1993; Sydeman 1993, Erikstad et al. 1995). A suite of potential confounding factors (loss of bands, emigration, intracolony movement, observer failure to see marked birds) complicate survival estimates based on banding and resighting (Harris and Wanless 1988; Hatch et al. 1993). Models have been developed which account for some of these problems (Pollock et al. 1990); overcoming the remaining uncertainties depends directly on the

amount of personnel effort that can be dedicated to banding and resighting work. Intensive effort will be required to resight banded birds, especially during the pre- egg-laying stage. Adult common murres are particularly difficult to resight, due to the murre's compact body posture while at the nest site.

Measurement of foraging effort and physiological stress:

Increased foraging effort may be the most important contributor to reduction in adult seabird survival (Golet et al. 1998), illustrating the trade-off between yearly reproductive output and longevity. In 1997-2000 we are measuring murre and kittiwake foraging effort (in terms of bird-hours spent away from the colony) using a series of 6-8 all-day nest watches spread throughout the incubation and chick-rearing periods. All-day watches give information on nest-site attendance (a measure of 'loafing time'[Zador and Piatt 1999], foraging trip duration, and chick provisioning rate. For example, during four years (1995-1998) of study we have observed that average foraging trips are more than 50% longer at Chisik Island than Gull Island (murres: 190 vs. 122 min; kittiwakes 254 vs. 166 min; respectively).

All of the birds captured for banding are also sampled for levels of corticosteroid stress hormones in the blood. We have already found a strong relationship between stress hormone levels and food (energy) intake (Kitaysky et al. 1999b) in growing chicks, and differences in baseline levels of stress hormones between the 'food-rich' colony at Gull Island and the 'food-poor' colony at Chisik Island (Kitaysky et al. 1999a). We will continue to analyze baseline corticosteroid levels in all birds banded for the survival study, and will eventually be able to relate survival to stress in individual birds, as well as between colonies.

B. Methods

Sample Size and Survival Statistics: Assuming a binomial distribution (sample unit being an individual adult, with survival being a yes or no), a power analysis of sample size in a two by two table predicts that a sample size of 47 marked birds per island would resolve a 6% difference in survival between colonies with acceptable statistical power and confidence (Table 1). To double the resolution (3%) would require a sample size nearly five times greater. However, a sample size of 185 is predicted to resolve a 4% difference with strong power and significance at the 0.05 level. Previous studies have reported murre survival rates ranging from 87% to 98%, measured at stable colonies (Hudson 1985, Sydeman 1993). Given that our study colonies represent relative extremes of population expansion and decline, it is not unreasonable to expect their survival rates to also be at the extreme ends of the normal range. Therefore, detection of a 4% difference with statistical significance should adequately address our primary hypothesis. To allow for a small percentage of known band loss, our goal is to individually mark a minimum of 200 birds of each species at each colony.

We were unable to complete our banding objectives during FY98 fieldwork (as detailed in the FY99 Restoration Project Annual Report). One of the local effects of 1998's El Niño

perturbation was markedly reduced attendance at our study colonies by both kittiwakes and murres. Furthermore, birds that did attend were unusually flighty and nervous, making them especially difficult to catch. Mainly due to these uncontrollable factors, we were not able to complete our target sample sizes of 200 marked birds of each species at each colony by 1998 (Table 2). By 1999, however, we had reached our target goals except for kittiwakes on Chisik Island. Kittiwakes remain difficult to capture owing to restricted access and the tendency for birds there to fail and desert nest-sites early in the season.

Furthermore, precise survival estimates based on banding are ideally generated by multi-year studies because long-lived seabirds often skip one or more years of attempts at breeding (Erikstad et al. 1995, Golet et al. 1998). Because of this, and also because returning birds are not always sighted in every year they come back to a colony (a function of observer effort and nest-site fidelity), it is desirable to have at least four years of re-sighting data for robust analyses of survival data (Pollock et al. 1990, Lebreton et al. 1992; W. Sydeman, pers. comm.).

We therefore proposed (and were funded for) an additional year of banding during summer 1999, necessitating an additional year of resighting fieldwork during summer 2000. The data analysis and writeup were projected into FY01. This extra year would boost our sample sizes into an optimal range, and allow for three years of resighting effort. However, it is clear that 4 years of resighting data are desirable for robust analyses of survival data (above), and we did not quite achieve our target sample size for kittiwakes on Chisik Island. We therefore propose to continue banding kittiwakes at Chisik in FY00, and conduct one more year of re-sighting in FY 2001. This would also allow us to continue coordination of survival studies with the study of physiological stress (EVOSTC Project 99479), which has continued funding for field work in FY01.

We are not asking for more funds to conduct this additional resighting work beyond what we had originally proposed for analysis and write-up in FY2001. The fall and winter of 2000-2001 will still be spent compiling survival data, analyzing it with respect to stress and food availability data, and preparing draft reports (at least introduction, methods, some results and preliminary conclusions). In May of 2001, we will do one more intensive re-sighting effort (re-sighting only, no banding or other bird work) to get the final (4th year) of re-sighting with which to assess survival. We do not expect these data to change the main conclusions, rather to provide more robust statistical results. These results will be quickly incorporated into the final database, analyzed, and reported by September 2001. Any additional costs required for this effort will be covered by USGS.

Cooperating Agencies, Contracts, and Other Agency Assistance

Personal Services contracts may be used for statistical consultation and programming assistance.

SCHEDULE

A. Measurable Project Tasks for FY 01

Oct. 1-Jan. 31:	Evaluate results of FY00 work
Feb. 1-April 15:	Compile results from all years, analyze and initiate report
March:	Attend EVOS Symposium
April 15-May 30:	Last resighting effort on Gull and Chisik Is.
June 30-July 31:	Compile FY01 re-sighting results, analyze all 4 years data
Aug. 1- Sep. 15:	Complete report
Sep. 15:	Submit Draft Final Report to EVOSTC
Sep. 15- Dec. 31:	Completion and submission of papers for publication in peer-reviewed journals
Dec. 31:	Submit Revised Final Report to EVOSTC

B. Project Milestones and Endpoints

June 30, FY 01:	Resighting fieldwork will be completed
Dec. 31, FY02:	Final Report Complete and Submitted to EVOSTC
Dec. 31, FY02:	Submission of papers for publication in peer-reviewed journals

C. Completion Date

Our proposed research takes advantage of a natural comparative system (failing vs. thriving colonies) to reduce the time required to test the hypothesis that increased energy expenditure and stress during the breeding season will decrease adult survival. We propose three full field seasons of banding, re-sighting, and collection of productivity data (FY98, FY99, FY00) and one season of re-sighting only (FY01) to ensure an adequate sample size for robust analysis of survival. Efforts in FY01 and part of FY02 will focus on data compilation, analysis and publication of research results in peer-reviewed journals.

PUBLICATIONS AND REPORTS

The final planned product of the proposed research will be the final report detailing all findings, due on Sep. 15, 2001. Publication of project results in peer-reviewed journals will be pursued as soon as scientifically appropriate and logistically possible.

PROFESSIONAL CONFERENCES

Results of this project will be presented during FY02 at the Annual Meeting of the Pacific Seabird Group, or at other professional meetings where appropriate.

NORMAL AGENCY MANAGEMENT

This research would not be conducted as a normal part of USGS research on seabirds.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

The proposed research issues are related to management and conservation of seabirds in Alaska as addressed by the U.S. Fish and Wildlife Service (USFWS) 'Seabird Management Plan' (USFWS Region 7, Migratory Bird Management). The proposed work will complement and be coordinated with: i) long-term studies conducted by the Alaska Maritime National Wildlife Refuge (AMNWR, USFWS Region 7), which includes annual monitoring of seabird productivity at 9 major seabird colonies throughout Alaska; ii) related studies (APEX) of seabird-forage fish interactions being supported by EVOSTC in Prince William Sound; and, iii) ongoing studies of seabird populations in areas of oil and gas development conducted by the Minerals Management Service (MMS) in Alaska and the Biological Resources Division of the USGS.

Logistic support from the USFWS and AMNWR will include vessel use, storage facilities, laboratory space, computer usage, and communications. Field sites and research platforms will be shared with the EVOSTC-funded APEX and sand lance projects.

EXPLANATION OF CHANGES IN CONTINUING PROJECT

The design of the proposed work has not changed. As explained above in 'Methods', however, banding efforts were extended by one year, and we propose one more re-sighting effort in FY01. This will give us 4 years of re-sighting data, greatly improving our ability to measure significant differences in survival of murres and kittiwakes at Gull and Chisik islands.

PRINCIPAL INVESTIGATOR

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PRINCIPAL INVESTIGATOR

Dr. John F. Piatt, Research Biologist (GS-14) with the Alaska Science Center, Biological Resources Division, USGS in Anchorage. Obtained a Ph.D. in Marine Biology from Memorial University of Newfoundland in 1987 (dissertation on seabird-forage fish interactions). Since 1987, studied seabirds at colonies and at sea in Gulf of Alaska, Aleutians, Bering and Chukchi seas. Author on 75 peer-reviewed scientific publications about seabirds, fish, marine mammals, and effects of oil pollution on marine birds. Responsible for coordination and oversight of the proposed research.

PROJECT LEADER

Thomas I. Van Pelt, MSc. student at the University of Glasgow, Scotland, and current employee (GS-9) of the Alaska Biological Science Center. Over seven years of experience working in Gulf of Alaska and Aleutian marine ecosystems. Responsible for project design, logistics, data analysis, and preparation of manuscripts and reports.

OTHER KEY PERSONNEL

Ann Harding and Mike Shultz (USGS/BRD staff involved with APEX project) will share responsibility for fieldwork, data management and analysis, and manuscript preparation.

COLLABORATORS

Dr. Alexander S. Kitaysky, University of Washington, Dept. of Zoology. Will collaborate on project design and provide advice on methodology and analyses.

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Table 1. Power analysis of sample size (in a two by two table). One minus beta is power; a power of <0.50 is typical in survival estimations. One minus alpha is the confidence interval. Ps and Pe are estimated survival fractions at two hypothetical colonies. Thus, with a sample size of 47 (banded birds per colony), we would expect to resolve a 6% difference (Ps minus Pe) with a power of 0.51 and 90% confidence intervals. With a sample size of 185, we would expect to resolve a 4% difference with a power of 0.75 and 95% confidence intervals. In general, as sample size doubles, variance is halved (Heisey and Fuller, 1985). Resolution of differences <4% demands unacceptably large sample sizes.

alpha	Zalpha	beta	Zbeta	Ps	Pe	n =
0.10	1.18	0.25	0.68	0.92	0.89	352
0.10	1.18	0.49	0.01	0.92	0.89	226
0.05	1.65	0.25	0.68	0.95	0.91	185
0.05	1.65	0.25	0.68	0.95	0.90	125
0.10	1.18	0.25	0.68	0.95	0.90	100
0.10	1.18	0.49	0.01	0.94	0.89	72
0.10	1.18	0.49	0.01	0.95	0.89	47

Table 2. Number of birds color-banded by year, location, and species.

Year	Gull Island		Chisik Island	
	Murre	Kittiwake	Murre	Kittiwake
1996	0	9	0	0
1997	30	40	132	69
1998	101	108	56	71
1999	68	114	74	29
Total	**199**	**271**	**262**	**169**

Grand Total: 901 (Gull 470; Chisik 431)
Note: Not included in total are 30 murres and 40 kittiwakes banded on Gull in 1997, but experimentally manipulated.

approved TC 8-3-00

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 1999	Proposed FY 2000
Personnel		$41.0
Travel		$0.0
Contractual		$0.0
Commodities		$0.0
Equipment		$0.0
Subtotal	$0.0	$41.0
General Administration		$6.2
Project Total	$0.0	$47.2
Full-time Equivalents (FTE)		0.8
Other Resources		

LONG RANGE FUNDING REQUIREMENTS					
		Estimated FY2002	Estimated FY2003		
		$0.0	$0.0		

Dollar amounts are shown in thousands of dollars.

Comments:
Requested funds in FY01 for personnel only-- and slightly higher than projected cost last year ($46.4) owing to employee wage increases. Funds required for brief, intensive re-sighting effort in FY01 will be provided by USGS base funds. Estimated at about 10K for temporary Biotech and volunteers, 8K for travel, charters and transportation, 3K for supplies and boat maintenance,

FY01

Project Number: 01338
Project Title: Survival of Adult Murres and Kittiwakes
Agency: U.S. Geological Survey

FORM 3A
TRUSTEE
AGENCY
SUMMARY

epared: 04/13/00

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel Costs:		GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	Proposed FY 2000
Name	Position Description					
Thomas van Pelt	Wildlife Biologist	GS-9	10.0	4.1		41.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		10.0	4.1	0.0	
					Personnel Total	$41.0

Travel Costs:	Ticket Price	Round Trips	Total Days	Daily Per Diem	Proposed FY 2000
Description					
none					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY01

Prepared: 04/13/00

Project Number: 01338
Project Title: Survival of Adult Murres and Kittiwakes
Agency: U.S. Geological Survey

FORM 3B
Personnel
& Travel
DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Contractual Costs:	Proposed FY 2000
Description	
none	
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$0.0

Commodities Costs:	Proposed FY 2000
Description	
none	
Commodities Total	$0.0

FY01

Prepared: 04/13/00

Project Number: 01338
Project Title: Survival of Adult Murres and Kittiwakes
Agency: U.S. Geological Survey

FORM 3B
Contractual & Commodities DETAIL

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2000
none			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency

FY01

Project Number: 01338
Project Title: Survival of Adult Murres and Kittiwakes
Agency: U.S. Geological Survey

FORM 3B
Equipment
DETAIL

Prepared: 04/13/00

Approved TC 8-3-00

Toward Long-Term Oceanographic Monitoring of the Gulf of Alaska Ecosystem

Project Number:	01340
Restoration Category:	Monitoring
Proposer:	T. Weingartner/UAF
Lead Trustee Agency:	ADFG
Cooperating Agencies:	None
Alaska SeaLife Center:	No
New or Continued:	Cont'd
Duration:	4th yr. 4 yr. project
Cost FY 01:	$72.0
Cost FY 02:	$0.0
Geographic Area:	Resurrection Bay, Gulf of Alaska shelf
Injured Resource/Service:	All

ABSTRACT

Interannual variations in the temperature and salinity of Gulf of Alaska shelf waters could significantly influence this ecosystem and, therefore, the recovery and restoration of organisms and services affected by the oil spill. This variability is best quantified from long time series such as that gathered over 30 years at a hydrographic station (GAK1) near Seward. This project will continue this time series to quantify variability on this shelf. It will also attempt to establish relationships between Seward sea level and shelf salinity and regional atmospheric pressure patterns and discharge variability. The data and the analyses will aid in designing a cost-effective ecosystem-monitoring program.

INTRODUCTION

This is a continuation proposal describing the fourth of a proposed four-year effort to maintain the 30-year time series of conductivity-temperature versus depth (CTD) data collected at hydrographic station GAK1. EVOS support for this program began in November 1997 with monthly cruises to station GAK1. These are continuing through September 2000. The monthly data are being supplemented with hourly (or shorter) measurements of temperature and conductivity at six depths using instruments moored at station GAK1. Weingartner (1999, 2000) gives a more complete description and analysis of the data collected thus far. However, the findings thus far indicate:

1. The anomalous summer 1997 warming (amounting to 1-2°C above normal) was confined to the upper 40 m of the ocean. That warming was mainly a result of anomalously clear skies and low winds during the summer of 1997.
2. The abnormally large El Niño-related winter 1998 warming (~2°C) occurred throughout the entire 250 m depth of the shelf. The return to near normal temperatures beginning last May and continuing through the present is being documented.
3. The abnormally large El Niño-related winter 1998 freshening (amounting to a vertically averaged salinity decrease of 0.15 psu) over the upper 200 m of the shelf. Freshening ceased in May and, below 200 m, was replaced with the saltiest waters ever observed at this location. These high salinity waters are enriched in nutrients and potentially available to phytoplankton in the surface layers.
4. A return to near normal temperatures after May 1998 which has continued.
5. The integral time scales for temperature and salinity at GAK1 are about 1 month, which implies that the monthly values (which comprise the historical data set) are not severely aliased.
6. Within-month temperature and salinity variance computed from the moored instruments is no greater than the interannual variability based on the monthly data from the historical record.
7. Variations in freshwater forcing and the baroclinic transport of freshwater are large on seasonal, interannual, and interdecadal time scales. On average freshwater transport increases fivefold between spring and fall. Alaska Coastal Current freshwater transport in spring 1998 (during the 1997-98 El Niño) was twice that of spring 1999.
8. The alongshore baroclinic transport in the upper 75m of the water column and within 30 km of the coast carries at least 50% of the total coastal discharge (as estimated by Royer, 1982) into the Gulf of Alaska.
9. The Alaska Coastal Current could significantly influence the marine ecosystem on the southeast Bering Sea. Our preliminary estimate is that the Alaska Coastal Current contributes about 25% of the Bering Sea freshwater supply. Therefore, improved understanding of environmental variability of the Gulf of Alaska ecosystem could improve our understanding of changes in the Bering Sea ecosystem.
10. Time series of coastal discharge estimates based on Royer's (1982) method, measured discharge, the leading EOF of precipitable water over the Northeast Pacific Ocean, and coastal salinity data all suggest a decrease in freshwater discharge into the northern Gulf of

Alaska from the late 1950s through the mid-1970s. Discharge increased from the mid-70s through the early-80s; coincident with the regime shift of the 1970s and with the PDO (Mantua, 1997; Overland et al., 1999). These findings add to other suggestions of a freshening across the North Pacific Ocean basin since the 1970s (Wong et al., 1999).

11. Monthly anomalies in the PDO index are coherent with Royer's monthly discharge anomalies at periods of 2 - 4 years and might be related to El Niño events.

12. Monthly sea level anomalies at Seward Alaska are significantly correlated with monthly anomalies of vertically integrated (0-200m) salinity and the 0/200db dynamic height. Hence sea level could serve as a proxy for shelf salinity variations here and perhaps elsewhere in the Gulf of Alaska. The Gulf of Alaska watershed and coastal ocean are severely undersampled with respect to precipitation, river discharge, and salinity. Long-term time series of these are lacking and even the future maintenance of existing discharge and weather stations is uncertain. There is a need to develop proxy variables that can be used to reliably estimate runoff and coastal salinity. A goal of this EVOS program is to determine if sea level can serve as a proxy for ocean salinity variations.

This program will continue the measurements at GAK1 and will continue examining other existing data sets with a particular focus on understanding the temporal and spatial variability in precipitation and runoff related to item 9.

The GAK1 environmental data appear representative of conditions in the northern Gulf of Alaska and the Bering Sea (Royer, 1993) and are being used to assess the role of environmental variability in the ecology of fisheries and marine mammals in these regions. Station GAK1 lies in 260 m of water at the mouth of Resurrection Bay, midway between Prince William Sound and Cook Inlet (Figure 1). GAK1 data should be helpful in placing many of the restoration studies sponsored by the Trustee Council in the context of interannual and interdecadal hydrographic variability. These data complement the goals of the Gulf of Alaska component of the U.S. Global Ocean Ecosystem Dynamics program (GLOBEC), which began in October 1997. As a PI on the Gulf of Alaska GLOBEC program, I have shared data (and sampling resources) from both programs to build a better understanding of the physical environmental variability of this shelf. GLOBEC is supported by the National Science Foundation (NSF) and the National Oceanic and Atmospheric Administration (NOAA). It consists of three components: monitoring, process studies, and modeling. Monitoring began in the Gulf of Alaska in October 1997, with modeling and process studies to follow in 2001. The proposal described here will encourage synthesis of the ecosystem studies supported by the Trustee Council and GLOBEC. In the following paragraphs we summarize the regional oceanography and the historical data from GAK1. This background information provides the context for understanding the rationale and the design of the project described in subsequent sections.

The circulation on the shelf and over the slope of the Gulf of Alaska is predominantly alongshore and cyclonic (counterclockwise) on average (Reed and Schumacher, 1986). Along the continental slope the flow consists of the Alaska Current, a relatively broad, diffuse current in the north and northeast Gulf which intensifies to become the swift and narrow western boundary current, the Alaskan Stream, in the west and northwest Gulf (Figure 2). Together these currents compose the poleward limb of the North Pacific Ocean's subarctic gyre and provide the oceanic connection between the Alaskan shelf and the Pacific Ocean.

The Alaska Coastal Current is the most striking shelf circulation feature in the Gulf, and station GAK1 is positioned along its inshore edge. The main axis of this swift (0.2–1.8 m s^{-1}) westward-flowing current is within 35 km of the coast (Royer, 1981; Johnson et al., 1988; Stabeno et al., 1995). The coastal current is a perennial feature that circumscribes the Gulf of Alaska shelf for some 2500 km (at a minimum) from its origin on the northern British Columbia shelf (or possibly even the Columbia River depending on the season) to where it enters the Bering Sea in the western Gulf. The current is intimately connected to Prince William Sound, feeding the Sound through Hinchinbrook Entrance and draining it primarily through Montague Strait and the westernmost passes (Niebauer et al., 1994). It is also the source of shelf waters for Cook Inlet and transports inlet waters southwestward through Shelikof Strait (Muench et al., 1981). The Alaska Coastal Current transported much of the oil spilled by the *Exxon Valdez* along the south and west coasts of Alaska (Royer et al., 1990).

The dynamics of the Gulf of Alaska shelf are closely coupled to the Aleutian Low atmospheric pressure system. Storms propagate eastward into the Gulf and are blocked by the mountain ranges of Alaska and British Columbia. Consequently, regional winds are strong and cyclonic and precipitation rates are very high. On the shelf, these winds impel an onshore surface Ekman drift and establish a cross-shore pressure gradient that forces the Alaska Coastal Current. The high rates of precipitation, up to 8 m yr^{-1}, cause an enormous freshwater flux (~20 % larger than the average Mississippi River discharge) that feeds the shelf as a "coastal line source" extending from Southeast Alaska to Kodiak Island (Royer, 1982). The seasonal variability in winds and freshwater discharge (**Figure 3**) is large. (Winds are represented in **Figure 3** as the upwelling index, a measure of the strength of cyclonic wind stress in the Gulf. Negative values mean coastal convergence and downwelling while positive values signify coastal divergence and upwelling. With respect to Alaska's south coast, negative values westward winds and positive values). The mean monthly "upwelling index" at locations on the Gulf of Alaska shelf is negative in most months, indicating the prevalence of coastal convergence. Cyclonic winds are strongest from November through March and feeble or even weakly anticyclonic in summer when the Aleutian Low is displaced by the North Pacific High (Royer, 1975; Wilson and Overland, 1986). The seasonal runoff cycle (**Figure 3**) exhibits slightly different phasing from the winds: it is maximum in early fall, decreases rapidly through winter when precipitation is stored as snow, and attains a secondary maximum in spring due to snowmelt (Royer, 1982).

The shelf hydrography and circulation vary seasonally and are linked to the annual wind and freshwater discharge cycles. **Figure 4** contrasts the cross-shore salinity structure in April, July, and December. (Density gradients are important in ocean dynamics and salinity is the predominant influence on ocean density in the Gulf of Alaska.) In April, the vertical and cross-shore density gradients are weak and the front (~10 km offshore) intersects both the surface and the bottom. In July, the vertical density gradients are strong and the cross-shore density gradients are relatively strong. Now the front is confined to the surface and has spread ~40 km offshore. In December, the stratification is moderate, the cross-shore density gradients are large and the front forms a 30-km wide wedge adjacent to the coast. These different frontal structures imply seasonally varying dynamics (e.g., Yankovsky and Chapman, 1997; Chapman and Lentz, 1995) that affect the transport and dispersal of dissolved and suspended material across the shelf. For example, surface drifters released seaward of the ACC drifted onshore (in accordance with Ekman dynamics). Upon encountering the ACC front, they moved in the alongfront direction, which is consistent with the geostrophic tendency implied by the cross-shore density distributions of **Figure 4** (Royer et al, 1979). Inshore of the ACC front, the surface layer spreads offshore as

discharge increases (Johnson et al., 1988). This cross-shelf circulation pattern could accumulate plankton and attract foraging fish. **Figure 4** also shows that near-bottom salinities are higher in summer than in spring and, in fact, maximum bottom salinities occur in fall coincident with minimum surface salinities and maximum inshore stratification (Xiong and Royer, 1984). The source of the high salinity water is the onshore intrusion of slope water when downwelling relaxes in summer (Royer, 1975, 1979). Simple 2-D models of this shelf suggest that the dense water is mixed upward in winter to supply the surface layers with nutrients in early spring (Williams and Weingartner, 1999). The swiftest along shore flows are found within and inshore of the front (Johnson et al., 1988), and most of the total transport is associated with the baroclinic component (Stabeno et al., 1995). The latter result is consistent with the finding that monthly coastal sea level anomalies at Seward are significantly correlated with upper ocean dynamic height and vertically averaged salinity anomalies at GAK1 (Weingartner et al., 2000). Dynamic height is a function of the vertically integrated ocean density. Horizontal gradients of dynamic height are proportional to the pressure gradients that accelerate ocean currents and provide an estimate of the oceanic transport. These findings are remarkable given the different nature of the sampling techniques: the sea level records were sampled hourly and then averaged into monthly means whereas the dynamic heights were from hydrographic measurements at GAK1 occupied several months apart. Royer (1979) also found that sea level and precipitation anomalies were well correlated.

The foregoing results suggest that there might be a relationship between monthly (and perhaps shorter period) *cross-shelf dynamic height (or upper ocean density) gradients* and a number of other variables including winds and/or freshwater discharge. Under GLOBEC support we are finding that there is a significant positive correlation between monthly anomalies in 0/100 db Alaska Coastal Current baroclinic transport and inner shelf (eventually GAK1) dynamic heights. The relationship appears to vary seasonally (although the number of degrees of freedom is small in some seasons): it is largest in fall and early spring ($r > 0.8$), negligible in summer, and negative in winter. Although these findings are promising I do not understand the seasonal changes in the correlations. I suspect that, if real, the seasonally changing correlation is related to the coastal current's response to seasonal changes in winds and discharge. That response is probably not linear. Nevertheless, if a reliable relationship can be constructed between GAK1 dynamic height and Alaska Coastal Current transport, then it might be possible to predict mass and freshwater transports (on at least monthly or longer time scales) from a single hydrographic station or mooring on the inner shelf. We also know that freshwater discharge (Royer, 1982; Weingartner et al., 2000) and winds (Livingstone and Royer; 1980) are coherent over a broad along shore distance. In addition, the integral time scales of temperature and salinity (calculated from the EVOS-supported mooring at GAK1, Weingartner, 1999), are about one month on this highly advective shelf. Because of the broad spatial scales and the long integral time scales it might be possible to construct one or two monitoring sites around the gulf that are representative of a broad along shore region of the shelf. If so the results would be useful for ecosystem monitoring, model evaluation (and perhaps data assimilation) and in retrospective studies.

It is very likely that transport variations in the Alaska Coastal Current affect the survival and/or condition of a number of marine organisms. This flow is apparently important in advecting zooplankton to important juvenile fish foraging areas. Napp et al. (1996) and Incze and Ainaire (1994) find that the major cohort of naupliar stage larvae available to first-feeding pollock larvae in Shelikof Strait originate in February–March on the shelf offshore of Prince William Sound and east of GAK1. Other studies indicate that the coastal current is an important feeding and

migratory corridor for numerous species of marine mammals (Calkins, 1986) and sea birds (DeGange and Sanger, 1986).

Figure 4 also suggests that near-bottom salinities are higher in fall than in spring and this is the case on annual average. Xiong and Royer (1984) showed that maximum bottom salinities occur in fall and are nearly coincident with minimum surface salinities and maximum inshore stratification (**Figure 5**). Although surface waters are diluted by coastal discharge (which peaks in fall), the source of the high salinity water is the onshore intrusion of slope water in response to the seasonal relaxation (or reversal) in downwelling (Royer, 1975; 1979). The deep-water influx in summer from across the continental slope could be important in re-supplying nutrients to the Gulf of Alaska shelf and adjacent embayments and therefore, plays an important role in biological production.

The oceanographic description sketched above stems from research that began in 1970. At that time research vessels from the University of Alaska and other organizations opportunistically sampled station GAK1 while in transit to and from the Seward Marine Center. This ad hoc sampling, conducted at nominally monthly intervals, was the beginning of what is now a 30-year time series for this station. Sampling became more routine (~monthly) in the early 1990s with support from NOAA and the use of a 25-foot vessel operated by the University of Alaska's Institute of Marine Science. EVOS support has systematized the sampling further and the mooring is yielding crucial new information on temporal variability in the thermohaline structure of this shelf. As a result of these efforts the GAK1 data set comprises the longest ocean time series for the high-latitude North Pacific Ocean, and the only one that includes salinity (Royer, 1993). These data reveal substantial interannual and decadal scale variability in both temperature (Royer, 1993) and salinity (Royer, 1996).

For example, Royer (1993) showed pronounced interdecadal temperature variations that included colder water in the 1970s, followed by warmer conditions in the 1980s and a return to normal or cooling conditions in the 1990s. Coincidentally, the relative dominance of commercially important fish species changed in the mid-1970s; crab and shrimp declined while salmon and groundfish populations increased (Albers and Anderson, 1985; Blau, 1986; Hollowed et al., 1994; Thompson and Zenger, 1994; Francis and Hare, 1994). These population shifts coincided with the beginning of a decadal North Pacific change in the atmosphere and ocean (Trenberth and Hurrell, 1994). Subsequent changes in this ecosystem followed in the 1980s with substantial declines in populations of sea lions (Merrick et al., 1987) and puffins (Hatch and Sanger, 1992). Vance et al. (1998) showed that the unusually warm surface waters prevalent throughout the Gulf of Alaska and the Bering Sea in the summer of 1998 were accompanied by observations of species typically associated with mid-latitudes and, in the case of the Bering Sea, with massive changes in the ecosystem.

Royer (1993) also showed that Sitka air temperature variability (for which records extend back to the mid-1800s) correlates with the GAK1 temperature anomalies at 200 and 250 m depths. He found that the 18.6-year lunar nodal tide accounts for a statistically significant fraction of the Sitka air temperature variability. Using the Sitka air temperatures as a proxy for shelf water temperatures, Parker et al. (1995) subsequently showed that the abundance of halibut and other commercially important species varies on a similar time scale and in conjunction with northern

North Pacific Ocean temperatures. While these correlations do not imply causality, they underscore the possible significance of monitoring ocean climate to detect both periodic changes and more radical shifts in the marine environment. Other EVOS-supported investigators studying murre nesting variability (Kettle et al., 1999) have used the data collected recently at GAK1. Other EVOS investigators have showed that warm ocean temperatures enhance survival of young-of-the-year salmon (Willette et al., 1999) and overwintering herring (Norcross et al., 1999). Conceivably the GAK1 record might eventually be used in management decisions.

There are also low-frequency variations in upper ocean salinities at what might be an 11–12 year period, which Royer (1996) ascribed to variations in runoff and precipitation. Much of the interannual variability in precipitation in the Gulf of Alaska is associated with changes in the strength and position of the Aleutian Low (Cayan and Peterson; 1989). Weingartner et al. (2000) also show that much of the low frequency variability is coherent with the Pacific Decadal Oscillation at periods of 2 – 4 years (the El Niño time scale). Changes in upper ocean salinity could affect circulation in the Alaska Coastal Current and also influence biological production by varying frontal properties, circulation strength, the vertical stratification of the water column, and the nutrient concentrations. All of these properties showed considerable differences during the fresh, warm spring of 1998 compared to the salty (but near normal temperatures) of spring 1999 (Weingartner, 2000). The GAK1 data also show substantial interannual variations in bottom water salinities, although these are not linearly correlated with variations in surface salinity. The absence of a correlation is not surprising because near-bottom salinities are linked to shelfbreak processes, while surface variations are associated with precipitation and runoff. Ruehs et al. (1999) are finding that salinity and NO_3 concentrations are positively correlated (**Figure 6**) so that variability in deep water salinity on the shelf probably mean interannual differences in nutrient supply. The GLOBEC program is providing a detailed and year-round description of the nutrients on the Gulf of Alaska shelf. As the amount of these data increase more reliable salinity–nutrient relationships can be established. If these are robust then it might be possible to use the GAK1 salinity time series as a proxy for subsurface nutrient concentrations. This relationship could be exploited in retrospective studies and would aid in the design and maintenance of future monitoring programs because salinity can be accurately measured much more easily (and inexpensively) than nutrients.

In summary, several data sets now suggest that the Gulf of Alaska ecosystem is sensitive to environmental variations on time scales ranging from interannual to interdecadal. Other data sets suggest possible biophysical linkages that cause these ecological responses. However, we lack an adequate characterization of shorter period (seasonal to synoptic) variations that might impinge on the biological components of this ecosystem. Moreover, a mechanistic understanding of the physical dynamics of the Gulf of Alaska shelf and the processes linking environmental variability to ecosystem alterations is lacking. These are complex problems that require a concerted and interdisciplinary approach involving process-specific studies in addition to ecosystem monitoring. Some of these programs (APEX and SEA) are sponsored by the Trustee Council, while a new initiative, the U.S. Global Ocean Ecosystem Dynamics program, began in the fall of 1997 on the Gulf of Alaska shelf. The GLOBEC program is specifically designed to elucidate details of the mechanisms underlying physical and biological environmental change on the shelf. For example, the nutrient cycles and concentrations on the Gulf of Alaska shelf are poorly understood at present (Reeburgh and Kipphut, 1986) but are being investigated in the GLOBEC program. Those results should benefit the monitoring proposed herein. In tandem, the GLOBEC- and Trustee-supported efforts will lead to improvements in ecosystem monitoring.

While the GAK1 time series has illuminated ocean variations having potentially significant ramifications for the marine ecosystem, the monthly sampling will not detect what might be important variations on shorter time scales. Present-day technology now allows inexpensive and accurate sampling at high temporal resolution of temperature and salinity from moorings deployed year round. In combination with monthly CTD sampling, this technology will enhance the value of the historical record, maintain the GAK1 time series, and contribute to the design of long-term ecosystem monitoring programs. The collection of these data forms the basis of this proposal.

NEED FOR THE PROJECT

A. Statement of Problem

The GAK1 monthly time series portrays the very large interannual and interdecadal variability of the high latitude North Pacific. With a greater sampling rate, shorter period variations can be detected, revealing any temporal aliasing problems. The results will enhance interpretations of the historical data and place the magnitude of previous anomalies in a better statistical framework. Moreover, the time series could serve as a proxy for transport in the Alaska Coastal Current. Variability in the marine environment, as reflected in ocean temperatures and salinities, and, if possible, shelf circulation, need to be quantified to understand the structure of, and changes in, the northern Gulf of Alaska marine ecosystem. Such changes might influence the recovery of many of the marine species and marine services listed in Table 4 of the Proposal Invitation. Indeed, several EVOS-supported investigators underscored the need to understand natural climate variability and its influence on the recovery of species injured by the oil spill (Purcell et al., 1999; Piatt and Irons, 1999; Duffy, 1999; Anderson et al., 1999). In conjunction with the historical data set from GAK1, the monitoring program described below will provide a useful data set to EVOS investigators and others concerned with ocean climate variations.

B. Rationale/Link to Restoration

This monitoring proposal provides an information service to current and future investigators working in the Gulf of Alaska and adjacent waters who need information on environmental variability. The information will help assess recovery and restoration progress by allowing these issues to be analyzed within the context of the long-term variability of the physical environment. The GAK1 data set provides some of that information and the proposed measurements will enable continuation of these efforts by collecting time series at GAK1 of:

1. Monthly temperature and salinity at every meter throughout the water column using a conductivity–temperature–depth (CTD) instrument.

2. Hourly temperature and salinity at several fixed depths distributed throughout the water column.

This information will assist in:

1. Understanding thermohaline variability on time scales ranging from the tidal to the interdecadal.

2. Interpreting historical data sets for use in retrospective studies.

3. Configuring a cost-effective, long-term monitoring program.

4. Designing process studies necessary to develop ecosystem models for this shelf.

C. Location

The fieldwork will be conducted at Station GAK1 at the mouth of Resurrection Bay. Both the CTD work and the mooring deployment and recovery operations will be conducted from the Seward Marine Center using the 25-foot vessel, *Little Dipper*. All data collected as part of this program will be available to any who desire it via files on the internet. The monthly CTD data will be combined with the existing historical data that are on the Institute of Marine Science webpage: http://www.ims.alaska.edu:8000/gak1/gak.dat. A new homepage will be created for the hourly time series after mooring recovery and editing of the data. The homepages will be linked.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

We do not see any overt connection to traditional ecological knowledge. However, the most expedient way to share these data with both the public and scientific communities is via the internet. Such a link will allow easy access to the data for those working at the community level and with traditional ecological knowledge. We have recently learned that the Alaska Department of Environmental Conservation (ADEC) maintains a VHF radio repeater on Rugged Island and within 1.5 miles of GAK1. The ADEC has indicated that the repeater station could be shared with other users. If technical obstacles can be overcome, we will seek to upgrade GAK1 so that data collected from this mooring could be transmitted, via VHF signal, in near real time directly into Seward (preferably the Alaska SeaLife Center) for immediate use and display. A VHF transmission would be considerably cheaper than data links via ARGOS or cell phone.

PROJECT DESIGN

A. Objectives

Two objectives motivate this multi-year program. First, we want to continue the 30-year time series at station GAK1 through a combination of monthly CTD measurements and through yearlong deployments of a mooring containing temperature and conductivity (T/C) recorders. Second, we want to contribute to the design of a cost-effective monitoring program for the Gulf of Alaska shelf. The sampling schemes complement one another with one providing high vertical resolution at monthly time scales and the other providing high temporal but relatively low vertical resolution. We recognize that our generic goal of ecosystem monitoring is a long-term undertaking requiring incremental efforts and so view our efforts as essential steps toward that goal. To guide our efforts we formulated several project-specific objectives, several of which are

underway, and discussed them in the first and second year's annual reports (Weingartner, 1999; 2000). These are:

1. Determine the rate of change of water mass properties (temperature and salinity) and the phasing of these changes at different depths. Some of these features, which are not resolved by monthly sampling, reflect important changes whose timing could be significant to the ecosystem. The data files will be made available on the time series homepage for downloading and as a graphical display. Key events will be highlighted and discussed as part of the graphical display.
2. Determine the basic statistical properties of the moored data and how variances in temperature, salinity, and dynamic height are distributed over depth and seasonally. Are there distinct vertical "modes" of variability that change with season? These results will also be summarized in a file containing textual, tabulated, and graphical information and will be accessible via the time series homepage.
3. We want to improve upon the understanding achieved this past year with respect to long-term freshwater forcing variations in the Gulf of Alaska. One approach to doing this is to compare simple atmospheric pressure patterns or indices with long term precipitation and/or stream flow measurements from around the gulf. Pressure patterns over the Northern Hemisphere have been reconstructed back to 1900. However, there is only one virtually continuous streamflow record for the northern Gulf of Alaska since ~1920 and continuous precipitation records date to 1930. Thus quantifying decadal scale variability is hampered by the lack of precipitation and discharge records. If proxies for these variables can be established then a surrogate discharge time series for the gulf can be reconstructed for the past 100 years. I anticipate that pressure patterns favoring northward atmospheric transport into the Gulf of Alaska might be highly correlated with regional runoff and precipitation. If such an index results then it would serve as a proxy for discharge variability dating to the early 1900s. Note that we are not trying to duplicate other indices (such as the PDO) which characterize hemispheric scales but rather to construct a more local (e.g., Gulf of Alaska) index that would be a better predictor of regional streamflow variations. These results will be made accessible on the homepage.

The first two objectives rely on continued sampling at GAK1. The last objective represents an exploratory study precipitated by the GAK1 data set and the results from Year 2 of this study reported by Weingartner (2000) and presented at the EVOS workshop and the AGU-ASLO Ocean Sciences meeting in 2000.

B. Methods

Funds are requested to monitor Gulf of Alaska temperature and salinity through FY 01, at which time a restructuring of the program described here will probably occur. By this time, the APEX and SEA programs will be completed and preliminary results from the U.S. GLOBEC-sponsored Gulf of Alaska monitoring component will be available (U.S. GLOBEC, 1996). Accomplishments from these programs (and from the work proposed herein) will catalyze a reconsideration of the monitoring effort. In addition, researchers working at the Alaska SeaLife Center will probably have monitoring interests to be considered as well.

We propose to collect data monthly with the Institute of Marine Science's 25-foot *Little Dipper* using a Seabird SBE-25 internally-recording CTD deployed from the vessel's winch. The sensors on this CTD are calibrated annually by the manufacturer. Field checks on the conductivity sensor are made from bottle salinities collected during each cast and analyzed on the salinometer at the Seward Marine Center. This procedure allows detection of CTD drift between calibrations by the manufacturer. The historical salinity data have an accuracy of ~0.01 or better using this instrument and these procedures. Temperatures are accurate to within 0.005°C.

The monthly sampling will be complemented by hourly measurements from six temperature/conductivity recorders (Seabird MicroCats; SBE model 37-SM) incorporated in a taut-wire, subsurface mooring at GAK1. The mooring can be deployed and recovered by the *Little Dipper* during the CTD cruises. The instruments will make hourly measurements at nominal depths of 30, 50, 100, 150, 200, and 250 meters. This distribution covers the near-surface (30 m), the upper ocean (30–100 m), mid-depth (150–200 m) and bottom (200–250 m) of the water column. (Although observations at the surface would be useful, obtaining these would entail a mooring with substantially higher hardware and fabrication costs and the need for a larger vessel for servicing.) While results from the first year indicate that mooring motion is unimportant, this is monitored with a pressure on the MicroCat at 30-m depth. Our prior experience with these and similar instruments (SeaCats) indicate that temperature and salinity drifts are generally <0.02°C and <0.03 psu/year, respectively.

The analyses of the data sets are straightforward.

Objective 1 is largely concerned with temporal aliasing issues associated with monthly sampling. Among the important processes that might be aliased are the summer onshelf influx of dense bottom water, changes in upper ocean stratification throughout the year as a consequence of winds and runoff, and the response of the thermohaline structure of the water column to synoptic scale forcing by the wind.

Objective 2 will be achieved by examining the empirical orthogonal functions (EOFs) of the temperature and salinity time series. The EOFs decompose the system variance into a set of linearly independent functions, with each describing a unique spatial and temporal structure. For the mooring data the system variance would be that computed from the salinity (or temperature) time series at all depths. Six EOF modes will result from the analysis because six depths are sampled. The modes are ordered according to the proportion of the total system variance that each comprise. Thus the first mode accounts for the greatest fraction of system variance and the sixth mode accounts for the smallest proportion. Often, only a few modes are required to describe the system variance, and the significance of a given mode will be assessed following Overland and Preisendorfer (1982). The spatial structure of a mode describes the distribution of amplitude with depth, while its temporal structure describes how the mode varies through time. The EOFs are useful in consolidating large and complicated data sets into smaller correlated subsets that facilitate physical interpretation. They might also contribute to future monitoring design by suggesting times and/or depths that are either over- or under-sampled. In the latter case, the EOFs could identify potential temporal or spatial aliasing problems.

For objective 3 I will use~40 years of monthly atmospheric precipitable water and atmospheric pressure indices obtained from the NCEP/NCAR reanalyzed meteorological fields interpolated

onto a 2.5° grid between 65°-35°N and 160°-120°W. (The website containing these data is http://www.cdc.noaa.gov./cdc/data.nmc.reanalysis.html#surface). The purpose is to construct statistical relationships between atmospheric pressure indices and precipitable water and stream discharge. Data for the latter are obtainable from the USGS website: http://2o-nwisw.cr.usgs.gov/nwis-w/AK/. We will also use Royer's Gulf of Alaska discharge time series in this analysis.

SCHEDULE

A. Measurable Project Tasks for FY 00 (October 1, 2000 – September 30, 2001)

October 15:	Monthly CTD surveys scheduled at mid-month; update homepage as CTD data are processed and edited; prepare wind fields and acquire meteorological fields.
November–December:	Deploy mooring (the mooring will be deployed as soon as instruments can be delivered from the manufacturer) during this month's CTD sampling.
September:	If FY 01 field monitoring is not funded, then recover mooring, send MicroCats for post-calibrations, begin data processing. Otherwise mooring will be recovered in December 2000 when replacement mooring is deployed.

B. Project Milestones and Endpoints

The data collected as part of this project will be available to a broad community of users. We anticipate that some will want "immediate" access to it. This desire often conflicts with the goal (and required time) of producing data of the highest possible quality. In the past, the final CTD data have generally been placed online 1–2 months after collection. The final edited temperature and salinity data from the mooring should be ready three months after instrument recovery. The delays arise because of post-calibration requirements (performed by the manufacturer) and final editing of the data sets (performed at the Institute of Marine Science). We intend to make much of the data, along with preliminary results, available for rapid dissemination. From a practical point of view this approach is prudent because for many users the differences between the raw and the final edited product are insignificant. We will attach appropriate warnings concerning data quality to both preliminary and final data products. Thus, we anticipate making most of the data available on the homepage one month after recovery of the mooring. However, data will not be released if there are severe concerns regarding its quality unless and until such concerns are resolved. In addition to these general considerations, we anticipate the following project milestones:

1. The first objective is to examine rates of change of water mass properties (temperature and salinity) and the phasing of these changes at different depths. This work is largely descriptive and will begin immediately after instrument recovery. Graphical data displays will be made available within 1–2 months of recovery. These will include textural information indicating features of interest. Displays will be updated periodically as new findings emerge. Eventually these results will be merged with those of the third objective.

2. The second objective pertains to basic statistical results and provides the modal description of system variance. The results will be made available in both preliminary and final fashion. These

calculations are straightforward and the results and preliminary interpretations would be made available within two months of mooring recovery. When the final data product is ready, we will update the GAK1 CTD homepage describing these statistics and their relevance to historical GAK1 data.

3. The third objective requires considerably more effort and will be completed by the end of the project.

If the mooring is recovered in September 2000, all objectives will be reached by early April 2001. If the mooring is recovered as scheduled in December 2000, all objectives will be reached by early June 2001.

C. Completion Date

This project will be completed in FY 01.

PUBLICATIONS AND REPORTS

No manuscripts will be submitted in FY 00. Data and results will be provided via internet as indicated above. If a pressure index – discharge relationship for the Gulf of Alaska (Objective 3) can be established these results would provide the basis for a paper examining long-term discharge (the past 100 years) variability in the Gulf of Alaska.

PROFESSIONAL CONFERENCES

Portions of the research will be presented at the international meeting, The Eastern Pacific Ocean Conference to be held in September 2000 in Sidney, British Columbia. The PI has been invited to chair a session on observations of biological and physical interactions in the eastern Pacific Ocean.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

We have discussed aspects of the GAK1 historical data with several investigators supported by the Trustee Council. Many have expressed interest in these data and know how to access it. Other scientists are aware of these data through papers and meetings, (e.g., the American Geophysical Union which serves primarily the U.S. oceanographic community and the North Pacific Marine Science Organization [PICES] composed of marine scientists from around the Pacific Rim). Though we have discussed in previous sections how we would make these data available, we welcome advice from the Trustee Council on additional ways to share these data with other investigators and/or the public.

Several UAF scientists are co-investigators on a GLOBEC proposal whose results would complement this proposal. The UAF investigators (Coyle, Paul, Haldorson, Whitledge, Weingartner) along with Royer (Old Dominion University) have funding from the NSF NOAA GLOBEC program to examine the Gulf of Alaska shelf ecosystem for the period October 1997–

December 2000. This work includes six R/V *Alpha Helix* cruises spaced throughout the year to examine the cross-shelf hydrography (including nutrients) and the distribution of phytoplankton, primary production, zooplankton and fish (mainly juvenile salmon and forage fish) in relation to the physical environment. These investigators have submitted a proposal to NSF-NOAA to continue the GLOBEC monitoring work in the Gulf of Alaska for the 2001 – 2004 period. Our new proposal seeks support for seven cruises/year to sample the Gulf of Alaska shelf including GAK 1. We emphasize that there is a possibility for considerable cost-sharing through GLOBEC of the monthly sampling at GAK 1. *If our GLOBEC proposal is renewed, then the GLOBEC cruises will sample GAK 1 seven times each year and reduce the number of cruises required on the Little Dipper. The enclosed budget, which seeks support for 12 Little Dipper cruises/year could then be reduced.*

We see these programs as highly complementary in several ways. First, the cross-shelf hydrography will provide a basis for comparison with variations observed at GAK1. Second, a sufficient number of cross-shelf dynamic height *gradients* (proportional to the ocean transport) would be available (68 including the historical data and those under the new GLOBEC proposal) to examine the correlation between this gradient and dynamic height at GAK1. This result will help determine if dynamic height at a single station can provide an index of transport in the Alaska Coastal Current. Third, a comprehensive nutrient data set will be made available for establishing the type of correlations alluded to in the introduction. If significant correlations are obtained at several depths in the water column, then the GAK1 data would be a proxy indicator of historical variations in nutrient concentrations (for some depths).

The GLOBEC proposal makes connections with other investigators. For example, we have offered berth space on the *Alpha Helix* during our GLOBEC cruises to Robert Day of Alaska Biological Research, Inc., Fairbanks, for his sea bird and marine mammal studies. (Dr. Day is submitting a proposal to the Trustee Council for this project.) Thomas Kline of the Prince William Sound Science Center participated in four GLOBEC cruise and plans to participate in this year's cruises also.

The effort described in this proposal takes a modest but important step toward achieving the goal of long-term, comprehensive ecosystem monitoring. There are compelling scientific and logistical reasons for believing that GAK1 will be a long-term site and that the sampling will eventually expand to include other disciplines. Resurrection Bay and the adjacent ocean are paradigmatic for much of the Gulf of Alaska shelf, and this area is easily accessible by marine scientists at Seward. Although our understanding of chemical cycling and biological processes on this shelf is limited at the moment, programs such as SEA, APEX, and GLOBEC will provide substantial new information for these disciplines. Results from these programs and those anticipated from the work proposed herein will contribute to the design of a comprehensive long-term monitoring strategy. Additional impetus for expanding the monitoring activities at GAK1 will occur as programs at the Alaska SeaLife Center evolve.

PROPOSED PRINCIPAL INVESTIGATOR

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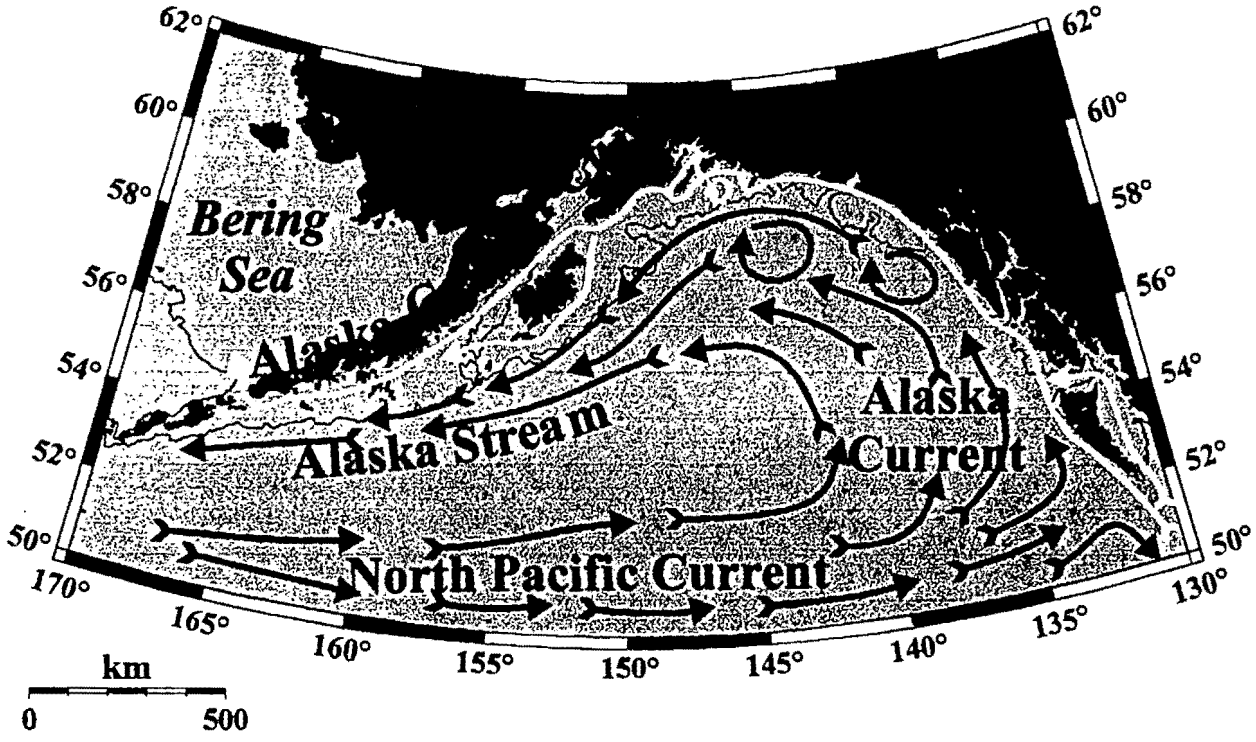

Figure 1. Schematic of the circulation of the Northeast Pacific and Gulf of Alaska.

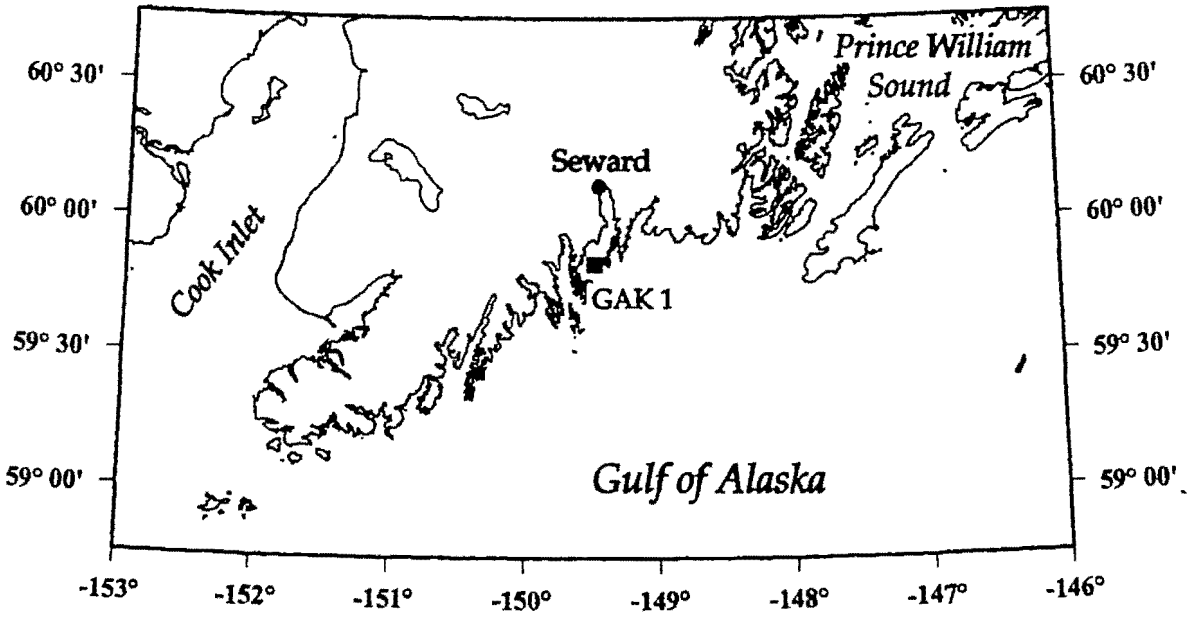

Figure 2. Map showing location of hydrographic station GAK1 in relation to Prince William Sound, Cook Inlet and Seward.

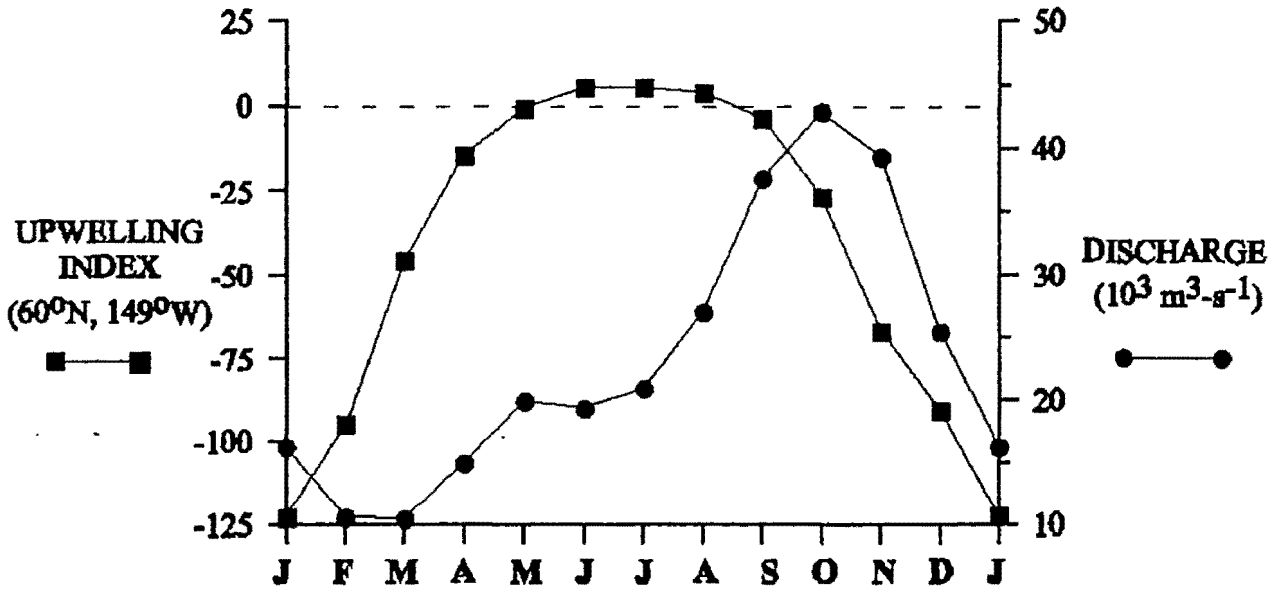

Figure 3. Mean monthly values of the upwelling index (from 1946–1995) and the estimated freshwater discharge (from 1930–1992) into the Gulf of Alaska using the hydrology model of Royer (1982).

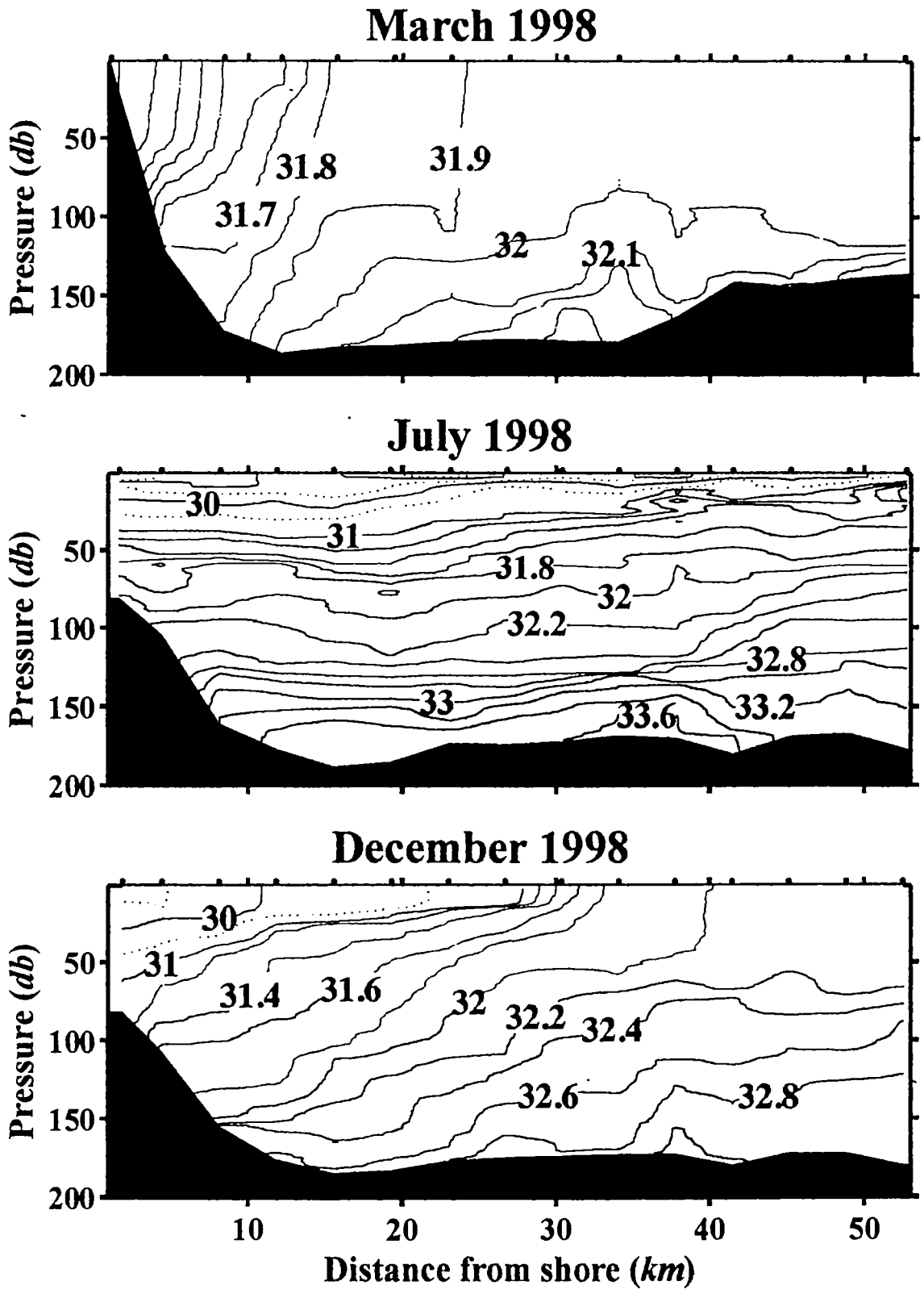

Figure 4. Contours of salinity as a function of depth and position in the Gulf of Alaska on a cross-shelf transect near GAK1. The upper panel is from April 1983 and the lower panel is from September 1993.

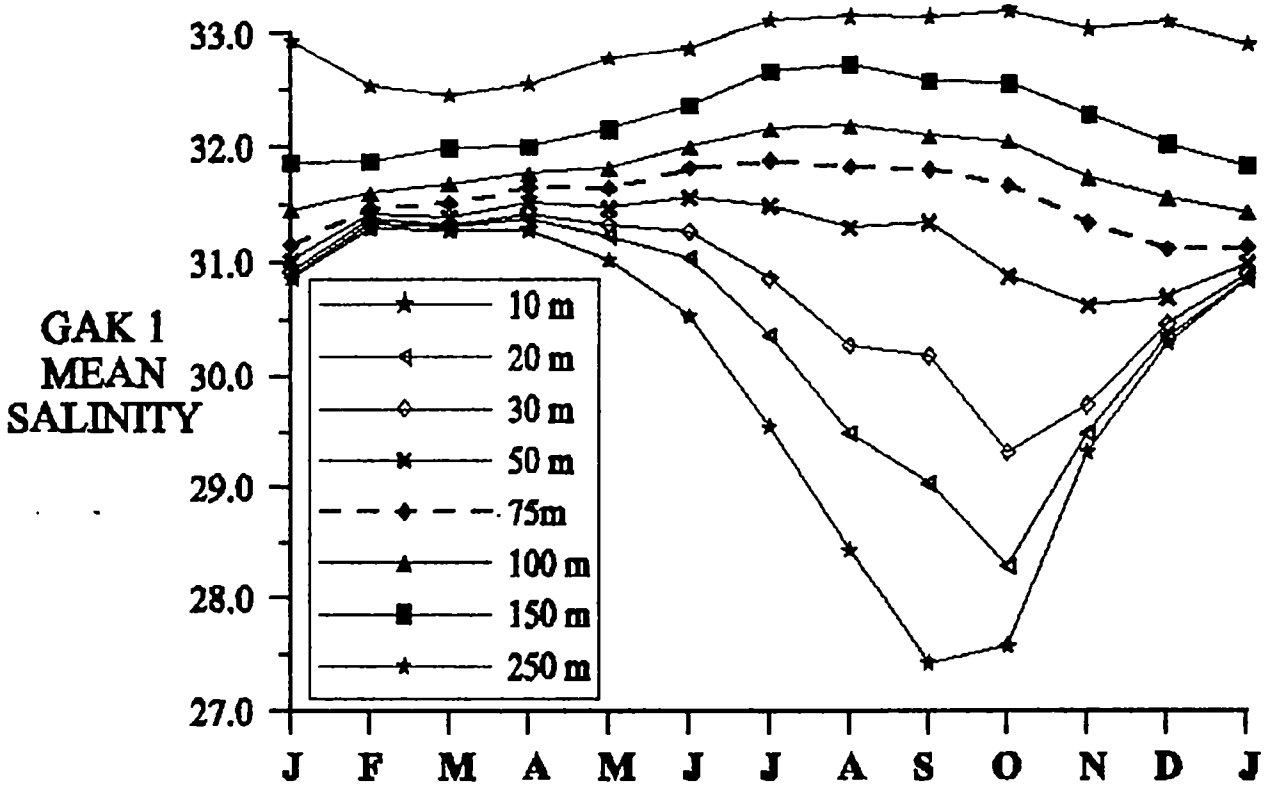

Figure 5. Mean monthly salinity at GAK1 as a function of depth. The means are computed from data collected between 1970 and 1996.

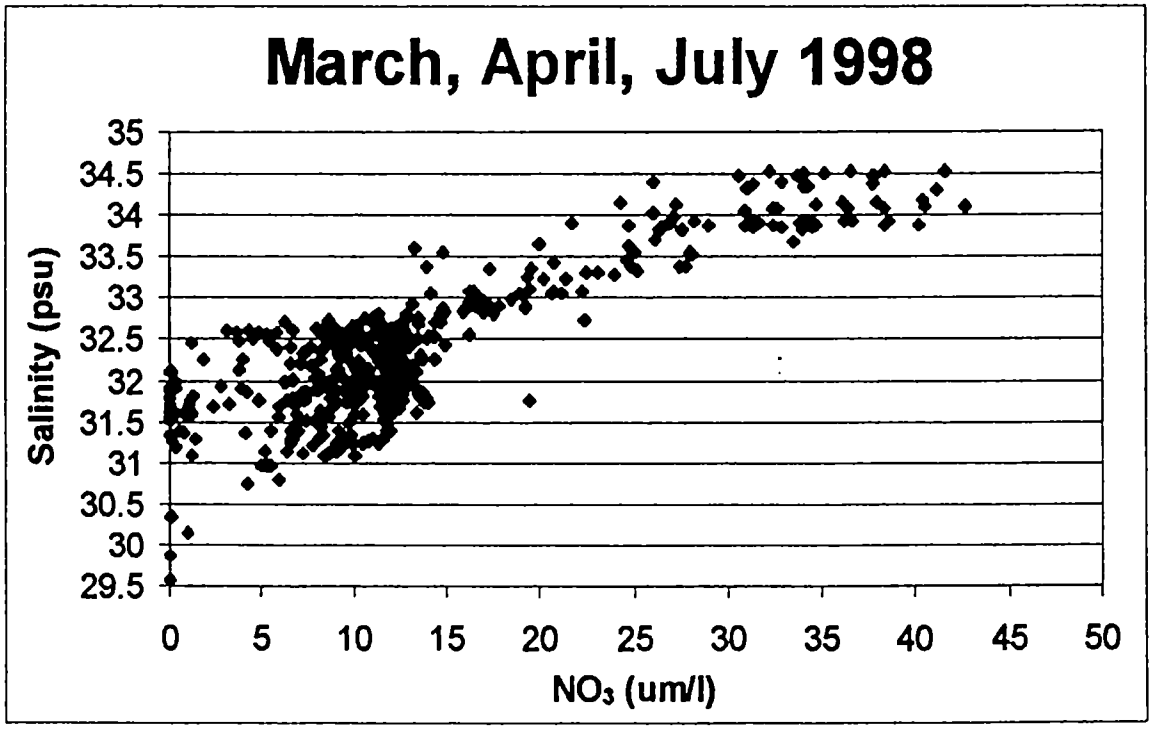

Figure 6. NO_3–salinity scatter plot from the shelf and slope of the northwest Gulf of Alaska (from Ruehs et al., 1999).

Revision 11/30/00
Approved 8-3-00

2001 EXXON VALDEZ TRUSTE)UNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

Budget Category:	Authorized FY 2000	Proposed FY 2001
Personnel		$0.0
Travel		$0.0
Contractual		$67.3
Commodities		$0.0
Equipment		$0.0
Subtotal		$67.3
General Administration		$4.7
Project Total		$72.0
Full-time Equivalents (FTE)		0.5
Other Resources		

LONG RANGE FUNDING REQUIREMENTS

		Estimated FY 2002	Estimated FY 2003		

Dollar amounts are shown in thousands of dollars.

Comments:

FY01

Prepared:

Project Number: 01340 Revised
Project Title: Toward Long-Term Oceanographic Monitoring of the Gulf of Alaska Ecosystem
Agency: Alaska Department of Fish and Game

FORM 3A
TRUSTEE
AGENCY
SUMMARY

Budget Category:	Authorized FY 1999	Proposed FY 2000

2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2000 - September 30, 2001

Personnel		$39.4						
Travel		$0.7						
Contractual		$11.7						
Commodities		$2.1						
Equipment		$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal		$53.9			Estimated FY 2001	Estimated FY 2002		
Indirect		$13.4						
Project Total		$67.3						
Full-time Equivalents (FTE)		0.5						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

The indirect rate is 25% TDC, as negotiated by the *Exxon Valdez* Oil Spill Trustee Council with the University of Alaska.

The budget costs include time for the PI and the technicians to complete the data analysis and report writing after the instruments are recovered

FY01

Prepared:

Project Number: 01340 Revised
Project Title: Toward Long-Term Oceanographic Monitoring of the Gulf of Alaska Ecosystem
Name: Thomas J. Weingartner

FORM 4A
Non-Trustee
SUMMARY

Personnel Costs:				Months	Monthly		Proposed
	Name	Position Description		Budgeted	Costs	Overtime	FY 2000
	Weingartner, T.	Principal Investigator/Assistant Prof.		2.0	6.8		14.2
	Vallarino, M.	Computer programmer		2.0	5.7		10.9

2001 EXXON VALDEZ TRUSTI OUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

	Leech, D.	Mooring and marine technician	[redacted]	2.3	5.7	0.3	14.3
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal	[redacted]	6.3	18.2	0.3	[redacted]
						Personnel Total	$39.4

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FY 2000
	R/T Fairbanks to Anchorage	300.0	1	3	120.0	0.7
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$0.7

FY01

Prepared:

Project Number: 01340 Revised
Project Title: Toward Long-Term Oceanographic Monitoring of the Gulf of Alaska Ecosystem
Name: Thomas J. Weingartner

FORM 4B
Personnel
& Travel
DETAIL

Contractual Costs:	Proposed
Description	FY 2000
Little Dipper (6 full days @ $500/day and 6 half days @ $250/hday)*	4.5
CTD calibration (SBE-25)	0.6
Microcat calibration (6 @ $600 ea.)	3.6
Shipping (R/T Seward to Seattle, CTD and MicroCats)	1.0

Shipping (R/T Seward to Boston)	1.0
Acoustic release alignment	1.0
*This estimate would be revised downward if the GLOBEC monitoring proposal submitted by Weingartner and colleagues is funded. In that case, GLOBEC will fund seven cruises/year on the RV *Alpha Helix*. Little Dipper cost would be for 3 full days and 2 half-days to total $2,000.	
Contractual Total	$11.7

Commodities Costs:	Proposed
Description	FY 2000
Batteries, O-rings, tools	1.0
Shackles, sling links, thimbles	0.5
Standard seawater (6 @ $30/vial)	0.2
Mooring anchor and lashing chain	0.4
Commodities Total	$2.1

FY01

Prepared:

Project Number: 01340 Revised
Project Title: Toward Long-Term Oceanographic Monitoring of the Gulf of Alaska Ecosystem
Name: Thomas J. Weingartner

FORM 4B
Contractual & Commodities DETAIL

2001 EXXON VALDEZ TRUSTI JUNCIL PROJECT BUDGET
October 1, 2000 - September 30, 2001

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2000
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage:	Number	
Description	of Units	
		[redacted]

FY01

Prepared:

Project Number: 01340 Revised
Project Title: Toward Long-Term Oceanographic Monitoring of the Gulf of Alaska Ecosystem
Name: Thomas J. Weingartner

FORM 4B
Equipment
DETAIL

Approved TC 8-3-00

Harbor Seal Recovery: Controlled Studies of Health and Diet

Project Number:	01341-CLO
Restoration Category:	Research
Proposer:	M. Castellini/UAF
Lead Trustee Agency:	ADFG
Cooperating Agencies:	None
Alaska SeaLife Center:	Yes
New or Continued:	Cont'd
Duration:	4th yr. 4 yr. project
Cost FY 01:	$82.2
Cost FY 02:	$0.0
Geographic Area:	Prince William Sound
Injured Resource/Service:	Harbor seal

ABSTRACT

This project will fund the last year of data analysis for a long-term study underway at the Alaska SeaLife Center quantifying the impact of feeding differing fish diets on the health and body condition of harbor seals. Even though health status biomarkers for marine mammals in Prince William Sound were established during field trials (Project /001), this Alaska SeaLife Center component is the critical test of how each marker varies in a seal depending on diet and season. The project will also establish whether specific diets are nutritionally adequate to maintain seal health by monitoring health parameters and measuring assimilation efficiency during feeding trials. While this project focuses on the issue of harbor seal health, the approach is potentially applicable to any of the injured top predators.

NOTE: Amended by 7-5-00 letter from M. Castellini. See p. 10.

SS

INTRODUCTION

An underlying component of the ecosystem-based research approach supported by the Trustee Council has been the hypothesis that food limitation could be inhibiting the recovery of injured species in Prince William Sound (PWS). Inherent in this concept is the assumption that food stressed animals can be distinguished by population-wide surveys of critical health parameters. Following this approach, an extensive sampling effort by multiple projects established a series of biomarkers used to profile the health and body condition of wild populations of marine mammals inside PWS. Population health status and body condition indices were developed and tested for a range of birds, sea otters and seals. On the basis of this wide-ranging effort, reference range values for these health parameters have been established and are being used to compare whole groups of animals across time and space (1–7). This approach is critical to understanding how these markers work on a population health level.

Establishing such a series of population-wide health indicators is necessary, but not sufficient, to link their biological activity to known health problems or food limitation. This is because the variability of each indicator over time or under different feeding conditions in any one individual cannot be tested in the field. In the sea otter and seal studies conducted under Trustee Council funding, each individual animal can only be captured once. Recaptures of individuals are extremely rare and opportunistic. Thus, we can establish the range of reference values for any particular indicator across a whole group of animals, but we do not know how this indicator varies within any given animal under changing conditions of health or feeding status.

The Trustee Council has supported the population-monitoring component of health biomarkers for marine mammals in Prince William Sound. At the Alaska SeaLife Center (ASLC) in Seward, we have been testing those biomarkers under controlled conditions, in the same animals over time and under changing experimental conditions. Of particular interest is the effect of specific diets on harbor seal physiology. This addresses the question of food limitation more completely, including the suggestion that certain prey may not be nutritionally adequate. Work on birds using the basic elements of this concept is also underway (5).

The Alaska SeaLife Center took possession of eight harbor seals in April 1998. Feeding trials for these seals began in September 1998 and will conclude in September 2000. The health and condition of the animals has been closely monitored (weight, morphometrics and biweekly blood samples). The database includes values for standard veterinary chemical and hematological values, morphological measurements including mass, length and girths, and ultrasound measurements to assess blubber depth. In addition, samples have been collected to determine levels of various biomarkers used in field studies, including haptoglobin, nitric oxide, metalothionien and levels of copper and zinc. The SeaLife Center also successfully rehabilitated three harbor seal pups in 1998 and four in 1999. Each of the pups was monitored carefully, including weekly morphometric measurements and blood samples to compare with the known healthy adult animals in the feeding trials.

Feeding protocols for the experiments were established in conjunction with the ASLC veterinarian and pinniped husbandry staff. Six of the eight seals were placed on experimental diets (herring or pollock) that were switched every four months for two years. The four-month periods correspond to three seasons – winter/molt, spring and summer. At the end of two years, each seal will have been on each diet during each season. Two additional seals have been placed on a mixed (50%

pollock, 50% herring) diet for the duration of the study. Monitoring of health and condition has continued, including biweekly measurement of weight, morphometrics and blood sampling. Assimilation efficiency and body condition experiments were conducted for each seal at the end of each trial. The seals are currently (April 2000) towards the end of the fifth feeding trial.

The animals being used in this study are also involved in two other EVOS-funded Restoration Projects. Using the same feeding protocols, Project 00371 is conducting experiments on stable isotope analysis with diet changes and Project 00441-BAA is conducting experiments on fat metabolism.

Fish being used as prey in this study are being analyzed for % water, % lipid, % nitrogen and energy density. These analyses are conducted regularly throughout the study to monitor different fish batches and any nutritional changes which may occur during food storage. Mean lipid content (± S.D; wet mass basis) for herring used in this study was 16.8 ± 2.2 % (n = 90), compared to pollock which was 4.9 ± 1.1% (n = 24). Mean energy density (± S.D.; wet mass basis) for herring was 9.5 ± 0.9 kJ/g (n = 40) compared to 5.1 ± 0.5 kJ/g (n = 25) for pollock. There has been no loss of lipid or energy density in frozen storage.

Data from the first year of trials indicate that body morphology, percent body fat and mass fluctuations are under a seasonal influence. Several blood enzymes and metabolites appear to change in response to diet, some with a potential seasonal component. These include, but may not be limited to, alanine aminotransferase, aspartate aminotransferase, gamma-glutamyl transpeptidase and creatinine. Most hematological variables were fairly constant, although hematocrit and hemoglobin values appear to be influenced by season, with no apparent effect of diet. Assimilation experiments are still in the early phase of analysis, although preliminary results suggest increased retention time on a herring diet. Statistically, the effects of diet, season and age cannot be separated until the end of the six trials, so while these data are interesting, they are preliminary and, by no means conclusive.

Seven harbor seal pups were successfully rehabilitated at the ASLC during 1998 and 1999. Two additional pups were more seriously injured and did not recover. While the number of individuals studied at this point is low, preliminary results show extreme perturbation in blood parameters of severely compromised individuals as well as long-term changes in blood parameters and morphometrics as individuals recover and develop. A number of potential factors could contribute to the variability, including development, captivity, early weaning and disease or injury. Pups had low cholesterol values when formula-fed, and decreases in gamma-glutamyl transpeptidase, triglyceride and hematocrit levels during their recovery. Percent granulocyte levels were good inidcators of exposure to infection. Increased sample collection and further analyses will enable more specific conclusions about the differences between healthy and unhealthy animals.

All ASLC work on this project will conclude in mid September 2000. The funding request for this proposal is for final laboratory analyses and statistical development. No further experimental work is expected during this year. The final report (April 2002) will be included in the next budget year.

NEED FOR THE PROJECT

A. Statement of Problem

The Restoration Program has established a strong field component that has tested a series of health and body condition biomarkers for many of the top-level predators in the Sound (1,2,4-6), including harbor seals (3,7). Many of these indices are related to metabolic alterations that might occur in animals that are food limited, or stressed. These include markers for fat, protein and carbohydrate metabolism (fatty acid patterns, blood urea nitrogen, ketone bodies, glucose), water balance (plasma and whole blood water), blubber quality in harbor seals (energetic density, lipid distribution, histology) and total body fat. Other markers have addressed more health or contaminant related issues such as indicators of oil contamination (P450, PAH), whole body inflammatory response (haptoglobin, interleukin), organic residue contamination (PCB) and clinical indicators of disease state (clinical chemistry panels, blood hemograms).

While this significant field-based effort is critical, these markers must be tested in the laboratory where animals can be fed different diets and put onto controlled caloric intakes. These markers must also be tested in the same animals over long time periods so that individual variance and seasonal differences can be monitored and experimental conditions altered. For example, we suspect that molting condition in harbor seals impacts haptoglobin levels, an indicator of inflammatory response, but until we follow the same animal through a whole season, we will not be able to test this theory. Finally, these markers must also be tested in animals known to be sick or injured (rehabilitation, stranded) to quantify how they vary with disease or poor health.

Recent results from a number of EVOS Restoration Projects (presented at Legacy of an Oil Spill: 10 Years after the *Exxon Valdez* Oil Spill) have demonstrated the critical nature of food composition to the growth and success of several injured species. The physiological response of seals to diets markedly different in lipid and energy content (assimilation efficiency, metabolizable energy, passage rate) are being assessed in captive seals fed the same controlled diets being used for monitoring health parameters.

B. Rationale/Link to Restoration

If we theorize that various health and body condition markers react in the field to ecosystem-wide changes in food availability or animal health, then we should be able to quantify those mechanisms in the laboratory under controlled conditions. The SeaLife Center has research animals that are healthy and have been put onto differing diets of specific prey. In addition, it has physiologically compromised animals that are brought in for rehabilitation. Both groups allow us to examine how these health markers respond to food and health status. Experiments following the same conceptual protocol have been carried out in Europe on harbor seals fed diets of fish that differed in contaminant loads (8). In those studies, it was found that seals fed contaminated fish showed measurable decreases in immune function. In this proposal, we have not been feeding contaminated fish, but rather fish of differing energy densities (pollock and herring) and monitoring unhealthy animals that are at the Center for rehabilitation. These "rehab" animals represent seals whose ability to survive in the wild has been compromised and they present a unique view into the biology of compromised animals that are under-represented in our field studies in the Sound (7).

An additional rationale concerns the "junk food" hypothesis. One of the most popular hypotheses concerning the cause for the decline of marine mammals and birds in Alaskan waters was first

voiced at a Sea Grant sponsored workshop in 1991 on whether or not food limitation could account for the observed population patterns (9). At that workshop, the "junk food" hypothesis was proposed. This thesis stated that Alaskan waters had a sufficient biomass of pollock to support the harbor seals and Steller sea lions populations, ***but*** pollock was nutritionally poor compared to other less common species, such as herring and capelin. Because the marine ecosystem of Alaska experienced a "regime shift" in the late 1970s that moved the system from a groundfish/herring based food web to a pollock dominated food web, the high-energy food that pinnipeds used to eat simply disappeared. Thus, the hypothesis proposes that seals and sea lions may be starving in a sea full of pollock. The experiments we have been conducting at the ASLC allow us to critically test this hypothesis.

C. Location

The experiments for this work are being conducted at the Alaska SeaLife Center in Seward. Additional studies on harbor seals (Restoration Project 00371 and 00941) have been using the same feeding regime for their experiments. Thus, there is considerable collaboration between the projects and significant sharing of resources and personnel. Similar experiments are underway with Steller sea lions through funding provided by the National Fish and Wildlife Foundation and NOAA.

For this budget period, all projects at the ASLC will have been concluded and final analyses and statistical tests will be conducted at the University in Fairbanks.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

The field work on harbor seals has involved integral collaboration with Native communities throughout the Gulf region in conjunction with the BIOSAMPLING program (Project /244) and we anticipate Native collaboration to continue. The Alaska SeaLife Center, the EVOS Trustee Council, the Alaska Native Science Commission and the Alaska Native Harbor Seal Commission are all currently working on joint scientific collaboration. Harbor seals are important food items for many Native communities, and results of these and previously funded studies will continue to be shared at the Alaska Native Harbor Seal Commission meetings.

An important mission of the Alaska SeaLife Center is to educate the public about unique Alaskan habitats and the importance of stewardship. It spotlights the role that research plays in understanding and contributing to the stewardship of that environment. Research done at the SeaLife Center is highly visible both to local communities as well as thousands of visitors each year. Recently, the National Park Service has declared the ASLC a NPS Public Learning Center with a focus on the population declines of harbor seals in Alaska which will further this collaboration. Researchers involved in our study volunteer time at the SeaLife Center to present information directly to the public, including school groups, and to provide updated information about the project to the Education Department.

PROJECT DESIGN

A. Objectives

This project quantifies the nutritional value of key Alaskan fish species for harbor seals and follows seal condition indices over time in both healthy and rehabilitation animals. There are four major objectives:

1. Feed controlled diets of pollock and herring to harbor seals.

2. Quantify body condition, health, and blood chemistry biomarker changes in the seals during the feeding trials and in rehabilitation seals during recovery.

3. Assess the assimilation efficiency (AE) of the different fish diets for harbor seals.

4. Quantify seasonal, metabolic state and clinical health impacts on biomarkers and health indices.

B. Methods

Feeding schedules and timing patterns of controlled diets have been developed in conjunction with the ASLC veterinarian and pinniped staff. There are other EVOS funded research projects that are taking advantage of controlled diet protocols and the design allows for the accommodation of these needs. In particular, EVOS Restoration Projects /371 and /441-BAA utilize the same feeding schedules to conduct their work on lipid metabolism and stable isotope biochemistry.

The eight harbor seals are currently in residence at the ASLC. Each animal is examined every two weeks for all measurements and all are trained to submit voluntarily to morphometric measurements and to voluntarily move onto scales to obtain mass values at least once a week. Several seals have been successfully trained to allow voluntary blood sampling. The eight animals are evenly split male/female, while four are mature animals and four are young.

Food maintenance trials

A detailed matrix of the feeding schedule is shown below. The procedure utilizes a cross-over repeated measures approach that allows statistical comparisons within any one group of seals between diet and season. Statistical software (SYSTAT) is used to analyze the cross-over method.

CROSS-OVER REPEATED MEASURES ANOVA
FEEDING TRIALS FOR HARBOR SEALS

PERIOD	HERRING	POLLOCK	CONDITION
Sept–Dec 1998	Seals A,B,C	Seals D,E,F	Molting
Jan–Apr 1999	D,E,F	A,B,C	Spring
May–Aug 1999	A,B,C	D,E,F	Breeding
Sept–Dec 1999	D,E,F	A,B,C	Molting
Jan–Apr 2000	A,B,C	D,E,F	Spring
May–Aug 2000	D,E,F	A,B,C	Breeding

Two seals (G, H) are in a separate feeding group. They are being fed a mixed diet of herring and pollock throughout the study. These animals will undergo the same procedures as the animals on single prey diets.

This feeding matrix allows each group of seals to experience a different diet at similar physiologically relevant times of the year. Group A,B,C, for example, was fed a herring diet during molting season in year one and a pollock diet in year two.

A problem with cross-over ANOVA designs is that residual or carry-over effects from previous treatments can complicate the analyses. We correct for this with extremely long test periods and phased cross-overs. That is, since each feeding trial lasts for four months, several weeks of diet switching are allowed. This provides the additional advantage of allowing us to study the biochemical impact of the phased switch.

In any captive situation, the behavior of the pinniped may influence feeding patterns, especially if the diet changes in palatability (10-11). Fortunately for this study, both fish species are part of the natural diet of harbor seals. In addition, feeding trials extend for four months and trainers work with the animals continually on feeding behavior. Animals are switched gradually from one diet to another over several weeks as the percentage of herring or pollock is adjusted. Under controlled feeding conditions, the feeding frequency during any given day impacts issues such as satiation and over-feeding. The trainers and husbandry personnel make sure that the animals are fed at the same time each day with a regular and adequate food intake.

An additional consideration is the number of animals per feeding trial. As shown above, we stagger animals through these long-term feeding schedules; however, three to six animals per trial are commonly used (12) and considered adequate for determinations of digestive efficiency.

Long-term alterations in the basic metabolic needs of the animals will occur as a result of annual cycles (e.g., molting). The metabolic demand of phocids varies throughout the year (13–14). We assume that the absolute number of maintenance calories per unit time changes seasonally. To offset these problems we have implemented the staggered feeding regime shown above. We separate the seals into two groups of three, one feeding on a different food item than the other. Each group feeds on a given food item for at least four months, then alternates with another group at the end of each four-month trial. These feeding trials last for two years, exposing each animal to various seasonal or yearly cycles with each prey species. This schedule provides standard deviations in assimilation efficiency, digestive efficiency and metabolizable energy while minimizing potential errors associated with temporal fluctuations (season or year) or metabolism (e.g., molting) and confounding errors associated with each prey item during a particular feeding trial. Although staggered feeding methods have been utilized in captive bird studies (15) few data exist on long-term assimilation studies for captive marine mammals.

The final issue is the application of laboratory data to the field environment. We are not modeling the metabolic demands of harbor seals in the wild. The stresses and food requirements of wild populations are very different from captive animals. Instead, we are investigating the metabolic response to differing diets and the effect of these diets on blood chemistry, blubber physiology and body condition of these animals. That is, we do not seek to model how many calories an animal may consume per month and apply that to field estimates of mass of fish consumed at sea. We

quantify how blood chemistry biomarkers change when an animal is fed several different kinds of fish and compare those chemical changes to observed patterns already collected from wild populations. This study is designed to investigate whether fish diets and seasonal alterations in food demand impact these chemical levels.

The food provided to the seals comes from frozen stocks of Alaska herring and pollock held by the ASLC husbandry collection. The fish are analyzed for body composition and inventoried by batch number so that any variation in food composition can be monitored. Analysis includes %water (freeze drying), %lipid (soxhlet extraction), %nitrogen (Kjeldahl extraction) and energy density (bomb calorimetry). Fish that are stored long-term are re-analyzed every one to three months.

Body condition, health and blood chemistry alterations

BODY CONDITION

Seals are weighed at least at every biweekly handling. The trainers continue to reinforce voluntary behaviors, and the seals are often weighed several times a week. At biweekly handling times, measurements of length, girth and blubber depth (using portable ultrasound) are collected. Every four months whole body bio-impedance (BIA) is measured as a proxy for water content and calibrated with labeled water. In this technique, deuterated water (D_2O) is injected into the seal, allowed to equilibrate with the total body water and then blood samples are drawn to measure D_2O dilution. This is a routine procedure for body water determination and we have used it on both Steller sea lions and harbor seals. In order to facilitate the field/laboratory comparisons, these morphological indices are the same as those we developed for use on wild populations of pinnipeds. Models of the most sensitive indicators for the field animals exist for harbor seals (7).

BLOOD CHEMISTRY

To date, we have a database of blood indices from over 500 adult harbor seals and 150 harbor seal pups as well as 350 Weddell seals, 400 Steller sea lion pups, 60 Steller sea lion juveniles and over 80 Steller sea lion adults collected under field conditions. These indices include not only clinical veterinary panels of blood chemistry and hematology, but also additional indicators we have developed for specialized use on pinnipeds.

Blood samples have been collected every two weeks from each harbor seal throughout the duration of the study. The blood sample is taken from the extradural sinus directly into the appropriate vacuum collection tube. We routinely take blood into both EDTA (for hematology) and heparin tubes (for chemistry). The blood is analyzed on site for most of the metabolites and hematological parameters of interest. Because these animals are highly trained for research protocols, this frequency of handling has not induced any negative behaviors that could compromise the project. All eight seals have been handled by research teams for many years and have easily adapted to their research protocols.

One of the implications of the junk food hypothesis is that the impacted animals are nutritionally stressed. Therefore, we have developed a series of blood indicators that provides a profile of the fasting and starvation status of pinnipeds. These markers include *ketone bodies* (metabolites produced to support neural function in the face of decreasing food intake), *blood urea nitrogen* (marker for increased muscle tissue degradation during starvation), *differential fatty acid utilization* (selective utilization of fat from lipid stores in the blubber during fasting), *water balance* in the plasma (particularly sensitive as pups gain nutritional independence) and red cell

characteristics including *hemoglobin content cell* and *mean cell volume*. We have found these markers to be useful in determining whether or not pinnipeds are feeding, fasting, or entering starvation in the wild (16-19).

Nutritional assimilation

Estimating prey or nutritional requirements of a predator using an energy model necessitates that assimilation efficiency be quantified (20). Assimilation efficiency (AE), which is defined as the proportion of dry matter assimilated from a prey source, is influenced by food quality, meal size, feeding frequency and digestive passage rate (21–23). Recent studies have suggested that assimilation efficiency is low when food quality is low (15, 24). For example, harp seals (*Phoca groenlandica*) fed Atlantic herring or capelin had a higher AE, and consumed less food, than those fed invertebrates of lower energy density (24). However, conflicting results have been reported for harbor seals (13) and northern fur seals (10), while studies of California sea lions fed pollock did not show a significant decrease in AE with lower energy density food, such as pollock (25).

Once the seals have been established on a specific diet during each feeding trial, they participate in two feeding experiments to quantify assimilation efficiency and metabolizable energy (ME). Each seal is fed a diet of the specific prey item(s), keeping other variables such as meal size and feeding frequency constant. In the first experimental regime, feeding frequency is four times a day. In the second regime feeding frequency is once a day. The design and interpretation of feeding experiments takes into account the potential effects of seasonal variation in AE and ME and this is discussed above in the feeding trial design using staggered schedules.

For all animals, dietary prey and fecal samples are freeze-dried and analyzed for energy (kJ/g), nitrogen, total lipid, and ash. Bomb calorimetry is used for energy density, nitrogen (protein) concentration is determined using a carbon–nitrogen auto-analyzer, total lipid by Soxhlet extraction and ash by muffle furnace combustion.

To determine digestibility of food absorbed in the digestive tract of seals, inert markers such as chromic oxide and cobalt-EDTA are added to the diets and subsequently assayed in fecal samples. These inert markers, along with naturally occurring manganese (Mn^{2+}) levels, are used to determine assimilation efficiency and compared with the digestibility results of a total balance trial. These markers have been used in pinniped AE studies (25–26) where dry matter digestibility has been calculated. Chromium, cobalt and Mn^{2+} concentrations are assessed using atomic absorption spectrophotometry (26). The tissue samples are extracted in Seward and analyzed by staff in Fairbanks.

In order to determine the passage of digesta (mean retention time), feces are collected during the feeding experiments. Rate of passage of digesta is one of the important factors that determine the efficiency of utilization of food (27). It has been documented in birds that the retention time of food in the gut is a function of food quality (28). In pinnipeds, such as the harbor seal, data indicate both high caloric prey items with soft parts and low caloric prey species have the fastest transit times through the digestive tract (29). However, the assimilation efficiency of the prey items fed to these seals was not known. Miller (10) reported that the passage rate of digesta in sub-adult female northern fur seals was rapid, although the AE appeared to be consistently high for the different prey items. Mean retention time is calculated in order to examine its relationship with AE. If prey size and feeding frequency are equal in all trials, prey items with higher energy

C. Cooperating Agencies, Contracts, and Other Agency Assistance

The Marine Mammal Protection Act permit and internal UAF and ASLC Institutional Animal Care and Use Committee permits required for this project are active.

SCHEDULE

A. Measurable Project Tasks for FY 01 (October 1, 2000 – September 30, 2001)

September-November:	Close down of all operations at ASLC. Sample and data transfer to Fairbanks.
November-February:	Final analyses of samples. EVOS annual meeting.
March-April:	Annual Report, prepare closeout DPD, meeting with collaborative projects.
April-September:	Final data analyses.

B. Project Milestones and Endpoints

FY 01: Wrap-up of feeding protocols, final data analysis

C. Completion Date

The experimental project will finish on September 30, 2001. Final report due April, 2002.

PUBLICATIONS AND REPORTS

The first annual report for this project, entitled Harbor Seal Recovery. Phase II: Controlled Studies of Health and Diet (7), has been accepted by the Trustee Council. This report presented baseline information about the seals before feeding trials were begun, as well as preliminary data on rehabilitated harbor seals. The second annual report has been submitted and contains results from the first series of feeding trials and more extensive analysis of data obtained from rehabilitated seals.

PROFESSIONAL CONFERENCES

Work on this project will be presented at the EVOS meeting in January 2001 and the Alaska Native Harbor Seal Commission meeting in March 2001. Presentations at other conferences are covered by travel grants through different sources.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

As noted above, there are several continuing projects on controlled diets in birds and mammals at the ASLC. These multiple experiments require close coordination from the associated principal investigators, the ASLC animal staff, veterinarian and staff, science officer and executive director.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

This proposal is for the final analyses and sample testing for /341 with no changes in plan.

PROPOSED PRINCIPAL INVESTIGATOR

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Revision 7-6-00
Approved 8-3-00

2000 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 1999 - September 30, 2000

Budget Category:	Authorized FY 1999	Proposed FY 2000
Personnel		$0.0
Travel		$0.0
Contractual		$76.8
Commodities		$0.0
Equipment		$0.0
Subtotal	$0.0	$76.8
General Administration		$5.4
Project Total	$0.0	$82.2
Full-time Equivalents (FTE)		1.5
Other Resources		

LONG RANGE FUNDING REQUIREMENTS

		Estimated FY 2001	Estimated FY 2002		
		$90.0	$0.0		

Dollar amounts are shown in thousands of dollars.

Comments:

FY00

Prepared:

Project Number: ~~00~~01341
Project Title: Harbor Seal Recovery. Phase II: Controlled Studies of Health and Studies
Agency: Alaska Department of Fish and Game

FORM 3A
TRUSTEE
AGENCY
SUMMARY

2000 EXXON VALDEZ TRUSTE[illegible]UNCIL PROJECT BUDGET

October 1, 1999 - [illegible]ember 30, 2000

Budget Category:	Authorized FY 1999	Proposed FY 2000
Personnel		$54.5
Travel		$0.8
Contractual		$4.1
Commodities		$2.0
Equipment		$0.0
Subtotal	$0.0	$61.4
Indirect		$15.4
Project Total	$0.0	$76.8
Full-time Equivalents (FTE)		1.5
Other Resources		

LONG RANGE FUNDING REQUIREMENTS					
		Estimated FY 2001	Estimated FY 2002		
		$90.0	$0.0		

Dollar amounts are shown in thousands of dollars.

Comments:

The indirect rate is 25% TDC, as negotiated by the *Exxon Valdez* Oil Spill Trustee Council with the University of Alaska.

Student personnel costs include resident tuition of $3,006 per year.

FY00

Prepared:

Project Number: 00341
Project Title: Harbor Seal Recovery. Phase II: Controlled Studies of Health and Diet
Name: Michael A. Castellini, University of Alaska Fairbanks

FORM 4A
Non-Trustee
SUMMARY

2000 EXXON VALDEZ TRUSTE UNCIL PROJECT BUDGET

October 1, 1999 - ımber 30, 2000

Personnel Costs:			Months	Monthly		Proposed
	Name	Position Description	Budgeted	Costs	Overtime	FY 2000
						0.0
	Castellini, M.A.	Principal Investigator/Professor	2.5	7.7		19.3
	Castellini, J. M.	Research Associate	3.4	4.7		16.0
		Ph.D. Student	12.0	1.6		19.2
						0.0
		Adjustment to recognize rounding				0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	17.9	14.0	0.0	
					Personnel Total	$54.5

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FY 2000
						0.0
	Fairbanks to Anchorage(1 person)	0.3	1	5	0.1	0.8
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Adjustment to recognize rounding					0.0
						0.0
						0.0
						0.0
					Travel Total	$0.8

FY00

Prepared:

Project Number: 00341
Project Title: Harbor Seal Recovery. Phase II: Controlled Studies of Health and Diet
Name: Michael A. Castellini, University of Alaska Fairbanks

FORM 4B
Personnel
& Travel
DETAIL

2000 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 1999 - September 30, 2000

Contractual Costs:	Proposed
Description	FY 2000
Contractual services (blood - veterinary analysis)	2.3
Contractual services (prey analysis)	0.8
Communications	1.0
Contractual Total	$4.1

Commodities Costs:	Proposed
Description	FY 2000
Samples collection	0.5
Laboratory expendables for collection and storage of other samples	1.5
Commodities Total	$2.0

FY00

Prepared:

Project Number: 00341
Project Title: Harbor Seal Recovery. Phase II: Controlled Studies of Health and Diet
Name: Michael A. Castellini, University of Alaska Fairbanks

FORM 4B
Contractual & Commodities
DETAIL

2000 EXXON VALDEZ TRUSTE[illegible]UNCIL PROJECT BUDGET

October 1, 1999 - [illegible]ember 30, 2000

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2000
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage:	Number	
Description	of Units	

FY00

Prepared:

Project Number: 00341
Project Title: Harbor Seal Recovery. Phase II: Controlled Studies of Health and Diet
Name: Michael A. Castellini, University of Alaska Fairbanks

FORM 4B
Equipment
DETAIL