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Exxon Valdez Oil Spill Trustee Council

645 G Street, Suite 401, Anchorage, AK 99501-3451 907/278-8012 fax:907/276-7178

AGENDA

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL MEETING **10/15/99**

October 22, 1999 @ 10 a.m. 1:45 pm

NOAA CONFERENCE ROOM #455 JUNEAU FEDERAL BUILDING

645 G STREET, ANCHORAGE

DRAFT **DRAFT**

Trustee Council Members:

BRUCE BOTELHO/CRAIG TILLERY
Attorney General/Trustee
State of Alaska/Representative

MICHELE BROWN
Commissioner
Alaska Department of Environmental Conservation

MARILYN HEIMAN
Special Assistant to the Secretary for Alaska
U.S. Department of the Interior

DAVE GIBBONS
Trustee Representative
U.S. Department of Agriculture
Forest Service

STEVE PENNOYER
Director, Alaska Region
National Marine Fisheries Service

FRANK RUE
Commissioner
Alaska Department of Fish & Game

Teleconferenced in Anchorage, EVOS Restoration Office, 645 G Street, Suite 401
Federal Chair

1. Call to Order 10 a.m.
   - Approval of Agenda
   - Approval of August 9,1999 and September 9, 1999 meeting notes

2. Executive Director's Report - Molly McCammon
   - Public Advisory Group Field Trip Report
   - Administrative Issues
     - Financial Report
     - Status of Investments
   - Habitat Protection Status Report
   - 2000 Annual Workshop

3. Public Comment Period 10:30 a.m.

4. Presentation on the Gulf Ecosystem Monitoring (GEM) Program

5. Lunch Provided During Executive Session (on Habitat Protection if needed)

6. Presentation and discussion on Small Parcel Process

DRAFT

* indicates tentative action items

Adjourn - 5 p.m.

raw

Exxon Valdez Oil Spill Trustee Council

645 G Street, Suite 401, Anchorage, AK 99501-3451 907/278-8012 fax:907/276-7178

TRUSTEE COUNCIL MEETING ACTIONS

September 9, 1999 @ 10 a.m.

By Molly McCammon
Executive Director

DRAFT

Trustee Council Members Present:

Dave Gibbons, USFS
Marilyn Heiman, USDOI
●Bruce Wright, NMFS
●Geron Bruce, ADF&G
●Marianne See, ADEC
*●Craig Tillery, ADOL

* Chair
In Anchorage via teleconference: Dave Gibbons, Marianne See and Craig Tillery.
In Juneau via teleconference: Bruce Wright and Geron Bruce.
In WDC via teleconference: Barry Roth and Marilyn Heiman

- Alternates:
  Bruce Wright served as an alternate for Steve Pennoyer for the entire meeting.
  Barry Roth served as an alternate for Marilyn Heiman until 10:08 a.m.
  Marianne See served as an alternate for Michele Brown for the entire meeting.
  Geron Bruce served as an alternate for Frank Rue for the entire meeting.
  Craig Tillery served as an alternate for Bruce Botelho for the entire meeting.

Meeting convened at 10:03 a.m.

1. Archaeology Project Costs

APPROVED MOTION: That the Trustee Council provide to the Alaska Department of the Natural Resources funding in the amount of $40,400 for support costs for the initial phase of the grant award to Chugachmuit, Inc., to develop an archaeological repository, local display areas and traveling exhibits. The initial phase of this project consists of preparation of the repository business plan and development of a solicitation process for local display facilities and is expected to be under taken between September 1999 and December 1999. These are to be considered capital project funds. Motion by Heiman, second by Wright.

Meeting adjourned at 10:15 a.m.

raw

Exxon Valdez Oil Spill Trustee Council

645 G Street, Suite 401, Anchorage, AK 99501-3451 907/278-8012 fax:907/276-7178

TRUSTEE COUNCIL MEETING ACTIONS

August 9, 1999 @ 9:00 a.m.

By Molly McCammon
Executive Director

DRAFT

Trustee Council Members Present:

*Dave Gibbons, USFS
Marilyn Heiman, USDOI
●Bruce Wright, NMFS
●Rob Bosworth, ADF&G
●Michele Brown, ADEC
●Craig Tillery, ADOL

In Anchorage: Dave Gibbons, Marilyn Heiman, Bruce Wright, Rob Bosworth, Michele Brown, and Craig Tillery.

* Chair
● Alternates:
Bruce Wright served as an alternate for Steve Pennoyer for the entire meeting.
Rob Bosworth served as an alternate for Frank Rue for the entire meeting.
Marianne See served as an alternate for Michele Brown from 9:28 to approximately 10:30 a.m.
Craig Tillery served as an alternate for Bruce Botelho for the entire meeting.

Meeting convened at 9:28 a.m.

Public comments received from three individuals from Anchorage and Nanwalek.

1. Approval of the Agenda

APPROVED MOTION: Approved the Agenda. Motion by Tillery, second by Heiman.

2. Approval of the Meeting Minutes

APPROVED MOTION: Approved March 1, 1999 and May 26, 1999 Trustee Council meeting notes. Motion by Wright, second by Heiman.

3. Termination Point Small Parcel - KAP 145

APPROVED MOTION: Adopted the Executive Director's recommendation to renew the current offer to the owners of KAP 145, continue to update the appraisal and give the owners until January 15, 2000 to accept the

offer. If no agreement is reached by that date, the offer expires. Motion by Tillery, second by See.

4. Morris Small Parcel - KEN 1084

APPROVED MOTION: Adopted the Executive Director's recommendation to make an offer of $38,000 for KEN 1084, of which $35,700 in unspent funds from the Sitkalidak Strait/Three Saints Bay parcels plus an additional $2,300 from the Kodiak Tax Parcel funds would be used to make the purchase. Motion by Bosworth, second by Wright.

5. Small Parcel Process

APPROVED MOTION: Adopted the Executive Director's recommendation that small parcel nominations continue to be accepted and reviewed, then forwarded to the Council for possible consideration as needed. Also, to have the Executive Director prepare a recommendation to be presented at the October Trustee Council GEM Workshop meeting, as to the future of the small parcel process, after 2001. Motion by Bosworth, second by Brown.

Off Record 11:02 a.m.
On Record 11:18 a.m.

6. Executive Session

APPROVED MOTION: Adjourned into an Executive Session for the purpose of discussing habitat protection negotiations. Motion by Heiman, second by Wright.

Off Record 12:03 p.m.
On Record 1:31 p.m.

7. FY 2000 Work Plan

APPROVED MOTION: Approved recommendations for FY00 projects as outlined in spreadsheets A & B, both dated August 2, 1999, and as amended by spreadsheet C, dated August 6, 1999 (see Attachments) along with the following changes: move Project proposals 00478, halibut satellite tags, and Project 00396, salmon sharks, from do not fund to defer. Also, continue with the condition that if a principal investigator has an overdue report from a previous year, no funds may be expended on a project involving the principal investigator unless the report is submitted or a schedule for submission is approved by the Executive Director. In addition, a project's lead agency must demonstrate to the Executive Director that

requirements of NEPA are met before any project funds may be expended (with the exception of funds spent to prepare NEPA documentation). Motion by Brown, second by Bosworth.

8. Restoration Reserve

APPROVED MOTION: Approved the transfer of $12 million from the CRIS-Liquidity Account to the *Exxon Valdez* Oil Spill Settlement Account, CRIS-Reserve Fund. In the event the transfer is not completed by September 15, 1999, interest against these funds shall also be transferred. Interest shall be accrued from September 15, 1999 until the time of transfer from the CRIS-Liquidity Account. Interest shall be calculated at the rate of five percent. These funds shall be invested pursuant to the investment policy for the Reserve Fund. The Executive Director shall certify when the funds are available for transfer and the applicable investment policy approved by the Trustee Council. Motion by Tillery, second by Brown.

9. Valdez Duck Flats PWS - 1028

APPROVED MOTION: Authorized the United States Forest Service to offer $120,000 for Prince William Sound 1028, consisting of 20.5 acres in the Valdez Duck Flats. Motion by Gibbons, second by Heiman.

Meeting adjourned at 3:21 p.m.

raw

Draft Gulf Ecosystem Monitoring (GEM) Program: Long-Term Monitoring, Research, and Stewardship in the northern Gulf of Alaska, FY 2003 and beyond

Review Draft

Circulation of this draft for the purposes of review is encouraged. Please direct comments by e-mail, gem@oilspill.state.ak.us, use the mailing address below or call 907-278-8012. Comments received by November 1, 1999 would be most useful. A new draft is expected on or before December 16, 1999. This draft is not for citation or attribution.

October 22, 1999

Exxon Valdez Oil Spill Trustee Council
645 G Street, Suite 400
Anchorage, AK 99501

gem@oilspill.state.ak.us

907-278-8012

Table of Contents

Executive Summary

To be written later

Program Narrative

To be written later, but we may not need it, if we do a good job on the Executive Summary

I. Introduction

A program rooted in the science of a large-scale ecological disaster is uniquely suited to form the foundation for ecosystem management. Knowledge and experience gained during ten years of biological and physical studies on the aftermath of the *Exxon Valdez* oil spill confirmed that a solid historical context is essential to understand the sources of changes in valued natural resources. Toward this end in March 1999 the *Exxon Valdez* Oil Spill Trustee Council (Trustee Council) dedicated a minimum of $115 million for long-term monitoring and research in the northern Gulf of Alaska (GOA). The new research fund is expected to be in place and functioning by October 2002. The fund is expected to function as an endowment, with an annual program funded through investment earnings. The goal is for the fund to be invested in a manner that allows for inflation-proofing and possible growth of the corpus. (See Appendix A for the full text of the Trustee Council resolution.)

In making the decision to allocate these funds for long-term program of monitoring and research, referred to herein as the Gulf Ecosystem Monitoring program, the Trustee Council explicitly recognized that complete recovery from the oil spill may not occur for decades and that through long-term observation and, as needed, restoration actions, injured resources and services are most likely to be fully restored. The Trustee Council further recognized that conservation and improved management of these resources and services would require a substantial ongoing investment to improve understanding of the marine and coastal ecosystems that support the resources as well as the people of the spill region. Improving the quality of information available to resource managers should result in improved resource management. In addition, prudent use of the natural resources of the spill area without unduly impacting their recovery requires increased knowledge of critical ecological information about the northern Gulf of Alaska that can only be provided through a long-term research and monitoring program that would span decades, if not centuries. There are both immediate needs to complete our understanding of the lingering effects of the oil spill and long-term needs to understand the sources of changes in valued natural resources.

A. Lingering Effects of the EVOS and Future Needs

The lack of information about the status of the marine resources prior to the spill was, and in some cases remains, a serious impediment to understanding the impact of human activities, both planned and unplanned. In spite of the current shortage of information on some species, a large body of new information has been assembled during the course of research following the oil spill. Much was learned about the plants and animals of the northern Gulf of Alaska (Figure 1) and their relationships to one another

and the physical environment. Even more important than the science so far assembled may be the improved understanding of the magnitude of our ignorance of physical and biological systems. Today, more than ten years after the *Exxon Valdez* oil spill, although it is reasonably clear that some of the injured natural resources and the services that depend on them have not fully recovered, the fate of others is still not known (Table 1). Of the twenty-six resources and three services reviewed by the Trustee Council in March 1999, only two were categorized as clearly "recovered," while six were placed in the category of "not recovering." The fact that most resources and all services were placed in the "recovering" category may reflect a lack of knowledge concerning the status of the resources and services at the time of the oil spill. That five resources were in the category of "recovery unknown" underscores the point that a solid historical context is essential to understand the sources of changes in valued natural resources. Studies are underway to learn more about cutthroat trout, Dolly Varden, Kittlitz's murrelets, and rockfish (EVOSTC 1999).

The main concerns about lingering effects of oiling relate to the potential effects of pockets of residual oil in the environment. Studies in the laboratory have shown that contact with petroleum hydrocarbons from weathered oil can kill or harm early life stages of pink salmon and Pacific herring. It is not yet known, however, whether such effects are actually occurring to any significant degree in Prince William Sound (PWS) or at other localities with residual oil. Tissue samples from higher vertebrates, such as sea otters and harlequin ducks, also indicate possible ongoing exposure to petroleum hydrocarbons in PWS. The effects of this exposure are not well established at the level of individual animals or at the population level.

Additional concerns about lingering effects of the spill include the ability of populations to overcome the demographic effects of the initial oil-related losses and the interaction of the effects of the oil spill with the effects of other kinds of changes and perturbations in the marine ecosystem. Sea otters around northern Knight Island are an example of a species with prolonged demographic effects. Examples of possible interactive, or cumulative, impacts are the combined effects of the oil spill and the 1998 El Niño event on common murres in the Barren Islands and the implications of changes in the availability of forage fishes on recovery of seabirds, such as the pigeon guillemot, from the effects of the oil spill.

As the Trustee Council moves from the restoration program to the Gulf Ecosystem Monitoring program, studies of lingering oil spill injury and recovery will be drawn to a conclusion in the near-term, to be increasingly replaced by long-term environmental monitoring and studies of ecosystem processes based on long-term monitoring. Studies that permit integration of our understanding of the biological processes of the entire marine ecosystem of the spill area, in the context of climatic and anthropogenic forces are made possible by the data provided by long-term environmental monitoring provided by many programs, including GEM.

Table 1. Status of injured resources, Exxon Valdez oil spill as of March, 1999.

NOT RECOVERING	RECOVERING	RECOVERED	RECOVERY UNKNOWN
Common Loon	Archaeological resources	Bald Eagle	Cutthroat Trout
Cormorants (3 spp.)	Black Oystercatcher	River Otter	Designated Wilderness Areas
Harbor Seal	Clams		Dolly Varden
Harlequin duck	Common Murre		Kittlitz's Murrelet
Killer Whale (AB pod)	Intertidal communities		Rockfish
Pigeon Guillemot	Marbled murrelet		
	Mussels		
	Pacific Herring		
	Pink Salmon		
	Sea Otter		
	Sediments		
	Sockeye Salmon		
	Subtidal communities		

Injured services considered to be recovering: Commercial fishing, Passive use recreation and tourism, and Subsistence.

B. Background

On March 24, 1989, the *T/V Exxon Valdez* ran aground on Bligh Reef in Prince William Sound, Alaska, spilling almost eleven million gallons of North Slope crude oil. It was the largest tanker spill in United States history, contaminating about 1,500 miles of Alaska's coastline, killing birds, mammals and fish, and disrupting the ecosystem in the path of the spreading oil. The damage assessment studies were concluded in 1992, although some of the lines of investigation were continued under the subsequent Restoration Program. More than $100 million was devoted to 164 separate and related damage assessment studies.

In 1991 Exxon agreed to pay the United States and the State of Alaska $900 million over ten years to restore, replace, enhance or acquire the equivalent of natural resources injured by the spill, and the reduced or lost human services they provide (Memorandum of Agreement and Consent Decree). Under the court-approved terms of the settlement, the *Exxon Valdez* Oil Spill Trustee Council was formed to administer the restoration funds. Restoration activities undertaken by the Trustee Council have been guided primarily by the *Exxon Valdez* Oil Spill Restoration Plan, which was adopted by the Trustee Council in 1994. In its Restoration Plan (EVOS Restoration Plan, 1994), the Trustee Council laid out a program with five categories of restoration activities: monitoring and research, general restoration, habitat protection, restoration reserve, and public information/administration.

From 1991 to date (through Fiscal Year 2000), the Trustee Council has approved the expenditure of approximately $155 million for research, monitoring, and general restoration projects. Up to an additional $16 million is designated for these purposes in FY 2001-02. In its restoration program, the Trustee Council has focused primarily on knowledge and stewardship as the best tools for fostering the long-term health of the marine ecosystem, rather than on direct intervention.

Most prominent among the projects funded by the Trustee Council are three ecosystem-scale projects, known primarily by their acronyms: SEA, NVP, and APEX. The Sound Ecosystem Assessment (SEA) is the largest project undertaken by the Trustee Council, funded at $22 million over a seven-year period. This project is formulating interacting numerical models designed to simulate the dynamic processes influencing the survival and productivity of juvenile pink salmon and herring rearing in Prince William Sound. SEA has provided new insights into ocean currents, nutrients, mixing, salinity, and temperatures and how these physical factors influence plant and animal plankton, prey, and predators in the food web.

The Nearshore Vertebrate Predator project (NVP) is a six-year, $6 million study of factors limiting recovery of four indicator species that inhabit nearshore areas. The project is looking at oil exposure, as well as natural factors such as food availability, as

potential factors in the recovery of two fish-eating species, river otters and pigeon guillemots, and two invertebrate-eating species, harlequin ducks and sea otters.

The Alaska Predator Ecosystem Experiment (APEX) concentrates on the productivity and recovery of seabirds based on the availability of forage fish as a food source. This eight-year, $10.8 million project is looking at wide-ranging ecological changes in an effort to explain why some species of seabirds are not recovering.

The three ecosystem projects, SEA, NVP, and APEX, are in the final stages of data analysis and report writing in FY 2000. The Trustee Council's emphases in FY 2000-02 will be to continue monitoring the recovery status of species injured by the oil spill, research factors that may be persisting in limiting recovery, conduct research that should lead to long-term improvements in resource management, disseminate restoration results, complete some general restoration efforts, and prepare for GEM.

Restoration projects have also been conducted on key individual species injured by the oil spill. The 1994 restoration plan identifies recovery objectives (measurable outcomes of restoration) and restoration strategies (plans of action) for each of the species known to have been injured by the oil spill. These objectives and strategies are regularly reviewed and were updated in 1996 and 1999.

As an example, nearly $14 million has been spent on the restoration of pink salmon. The recovery objective for pink salmon states that recovery will have occurred when population indicators, such as growth and survival, are within normal bounds and there are no statistically significant differences in egg mortalities in oiled and unoiled streams for two years each of odd- and even-year runs in Prince William Sound. When last measured (1997), higher egg mortality persisted in oiled compared to unoiled streams. Strategies currently being employed to achieve recovery of pink salmon are: research and monitor the toxic effect of oil (including examining the natal habitat of pink salmon in Prince William Sound for evidence of oil contamination), provide management information (for example, conducting genetic studies related to survival), and supplement populations (on select streams).

Roughly $6 million has been spent on the restoration of Pacific herring. The recovery objective for herring states that recovery will have occurred when the next highly successful year class is recruited into the fishery and when other indicators of population health are sustained within normal bounds in Prince William Sound. Increased biomasses of herring were identified in 1997 and 1998. However, the population has yet to recruit a highly successful year-class. Current strategies for achieving recovery are: investigate causes of the crash (in particular, disease) and investigate ecological factors that may be affecting recovery (such as effects of oceanographic processes on year-class strength and adult distribution).

Over $5 million has been spent on the restoration of marine mammals, primarily harbor seals. The recovery objective for harbor seals states that recovery will have occurred when their population is stable or increasing. The latest data, which is for the period 1989-97, indicates that harbor seal populations have declined on average 5 percent annually. The current restoration strategy for harbor seals is to continue to research and monitor populations (with research efforts focused primarily on food availability).

During the course of its investigations, the Trustee Council collected information on hundreds of species of animals and plants, including sockeye salmon, cutthroat trout, black oystercatchers, river otters, mussels and kelp. Occurrence and distribution of constituents of spilled oil and naturally occurring hydrocarbons were documented. Oceanographic data such as temperature and salinity were also collected. As of 1999, more than three hundred articles had been published in scientific journals in the United States and all over the world, numerous theses and dissertations (Appendix C), and hundreds of project reports.

In addition to monitoring, research, and general restoration projects, protecting habitat has been a major restoration tool. The Trustee Council has committed roughly $376 million to protect about 650,000 acres important for restoration of injured resources. Many species injured by the oil spill nest, feed, molt, winter, and seek shelter in the habitat protected through the Trustee Council's habitat protection and acquisition program. Several other species live primarily in the nearshore environment and benefit from the protection of the nearby uplands.

In addition to the activities described above, each year since FY 1994 the Trustee Council has placed $12 million into the Restoration Reserve. The general purpose of the reserve is to ensure that there are funds available for restoration activities after the final payment is received from Exxon in 2001.

C. Human Uses and Activities

The influence of human use and activities provides an important context for development of the GEM program. Within the oil spill area and the nearby population centers of Anchorage and Wasilla live 54 percent of the state's 621,000 permanent residents. When the resident population is combined with over one million tourists each year, it becomes clear that the natural resources of the spill area cannot be immune to the pressures associated with human uses and activities. The private sector economy of Alaska is heavily dependent on extraction of natural resources, primarily oil and fish, followed by timber, minerals and agricultural products.

Within the area affected by the oil spill (Figure 1) there are about 70,000 full time residents, while two to three times that number use the area seasonally for work or recreation. Numbers of residents and seasonal transients are relatively small compared to

the millions of people outside the GOA region who are involved in commerce and consumption of its natural resources, especially oil, fish and tourism. While this section describes the people of the northern Gulf of Alaska and their use of resources, it should be remembered that population growth outside the region fuels increasing demands for human uses and activities within the region.

1. Prince William Sound

Prince William Sound lies to the north of the Gulf of Alaska and to the west of Cordova. About 7,000 people live in the Prince William Sound area. The largest communities in Prince William Sound -- Cordova, Valdez and Whittier -- are all coastal and predominantly non-Native, although Valdez and Cordova are home to Native corporations. Chenega Bay and Tatitlek are Native villages. All five communities are accessible by air or water and all have dock or harbor facilities. Only the ports of Valdez, in the north, and Seward (just outside the western entrance to PWS, see Kenai Peninsula, below) now link Prince William Sound to the State's main road system, but this will change in 2000. The Alaska Railroad presently carries automobiles, boats and passengers to and from Whittier, a coastal community on the banks of Prince William Sound, north of Seward, which is just outside the Sound (Figure 1). A road scheduled for completion in 2000 will allow cars to drive directly to Whittier. Since Whittier is much closer by road to Anchorage than Valdez or Seward, automobile access undoubtedly means increased human uses of Prince William Sound.

The economic base of the five communities in the Sound is typical of rural south-central Alaska. Cordova's economy is based on commercial fishing, primarily for pink and red salmon. As the terminus of the Trans-Alaska Pipeline, Valdez is dependent on the oil industry, but commercial fishing and fish processing, government and tourism also are important to the local economy. The Prince William Sound Science Center and its Oil Spill Recovery Institute provides a base for scientific research in Cordova. Large oil tankers routinely traverse Prince William Sound and the northern Gulf of Alaska to and from Port Valdez. In addition to working as oil industry employees, Whittier residents also work as government employees, longshoremen, commercial fishermen and service providers to tourists. The people of Chenega Bay and Tatitlek augment commercial fishing, aquaculture and other cash-based activities with subsistence fishing, hunting and gathering.

2. Kenai Peninsula

The Kenai Peninsula on the northwest margin of the Gulf of Alaska separates Cook Inlet from Prince William Sound (Figure 1). The central peninsula is on the main road system, so much of it is only a few hours by car from the major population centers of Anchorage and Wasilla. About 49,000 people live on the Kenai Peninsula. About two-thirds of the region's population live in the central part of the Kenai Peninsula in the

vicinity of the cities of Kenai and Soldotna. The economy of this area depends on the oil and gas industry, commercial fishing, tourism, and forest products. This area was the site of the first major Alaska oil strike in 1957, and it has been a center for oil and gas exploration and production since that time. The Kenai River and its tributary, the Russian River, are major sport fishing rivers, attracting tourists from Anchorage and all over the world. The ports of Kenai and Homer are home to major commercial fishing fleets for salmon, and Homer supports vessels that fish for herring, shrimp, crab, and groundfish species such as halibut. Marine sports fishing is a major attraction for the tourist industry in Kenai, Seward, and especially in Homer.

The southern Kenai Peninsula contains the cities of Homer and Seldovia and the Native villages of Nanwalek and Port Graham. Homer, on the north side of Kachemak Bay, is the southern terminus of the state's main road system on the peninsula. Seldovia, Nanwalek and Port Graham, all located south of Kachemak Bay, are accessible only by air and sea. Homer is the economic and population hub of the southern part of the peninsula and depends on commercial fishing, tourism, and forest products. Nanwalek and Port Graham are largely dependent on subsistence hunting and fishing, and village corporation enterprises such as the salmon hatchery and logging enterprise at Port Graham.

Seward is a seaport on the eastern Kenai Peninsula nearby the western entrance of Prince William Sound. It is the southern terminus of the Alaska Railroad, which transports marine cargo and passengers to and from Anchorage. Seward can be reached by car from Anchorage by the Seward Highway and from Kenai, Soldotna and Homer by the Sterling Highway. Tourism is an important and growing part of Seward's economy. Cruise ships dock at Seward's harbor and commercial vessels take passengers on tours of the nearby Kenai Fjords National Park. The Alaska SeaLife Center on the waterfront in Seward is both a tourist destination and a marine research facility. The Qutekcak Corporation operates a hatchery that produces clams and scallops for a growing aquaculture industry in Prince William Sound and southeastern Alaska.

3. Kodiak Island archipelago

The Kodiak Island archipelago lies to the west of the northern Gulf of Alaska. This region includes the city of Kodiak and the six Native villages of Port Lions, Ouzinkie, Larsen Bay, Karluk, Old Harbor and Akhiok. About 14,000 people live in this region, although the population swells in the fishing season. Communities on Kodiak Island are accessible by air and sea. Approximately 140 miles of state roads connect communities on the east side of the island.

The economy is heavily dependent on commercial fishing and seafood processing. Kodiak is one of the world's major centers of seafood production, and it has long been among the largest ports in the nation for seafood volume or value of landings. Residents of the Native villages largely depend on subsistence hunting and fishing. Kodiak Island is also home to a commercial rocket launch facility that held its first successful launch in 1999. The 27-acre Kodiak Launch Facility is 25 miles southwest of the city of Kodiak at Cape Narrow. Commercial timber harvest occurs on Afognak Island, which is north of Kodiak Island. The U.S. Coast Guard Station near Kodiak is a major landowner and employer.

4. Alaska Peninsula

Alaska Peninsula lies to the far west of the northern Gulf of Alaska (Figure 1). Five communities on the south side of the Alaska Peninsula were affected by the *Exxon Valdez* oil spill: Chignik, Chignik Lagoon, Chignik Lake, Ivanof Bay and Perryville. The population of the area is about 400 year-round, but doubles during the fishing season. All five communities are accessible by air and sea. Numerous airstrips are maintained in these villages and scheduled and chartered flights are available. There are no roads connecting these villages. ATVs and skiffs are the primary means of local transportation.

The cash economy of the area depends on the success of the fishing fleets. Chignik and Chignik Lagoon serve as a regional salmon-fishing center, while Dutch Harbor, southwest of Perryville and somewhat outside the spill area, is a major center for crab and marine fish. In addition to salmon and salmon roe, fish processing plants in Chignik produce herring roe, halibut, cod and crab. About half the permanent population of these communities is Native. Subsistence on fish and caribou is important to the people who live in Chignik and Chignik Lagoon.

Chignik Lake, Ivanof Bay and Perryville are predominantly Native villages and maintain a subsistence lifestyle. Commercial fishing provides cash income. Many residents leave during summer months to fish from Chignik Lagoon or work at the fish processors at Chignik. Some trap during the winter, and all rely heavily on a diverse array of subsistence food sources, including salmon, trout, marine fish, crab, clams, moose, caribou, bear, and porcupine.

D. Global Climate Change

Global climate change is an essential context for development and implementation of the GEM program. Uncertainty over the extent to which the forces of climate drive the abundances of plants and animals in marine ecosystems has long been with us. Human activities appear to have both short- and long-term consequences for the amount of biological production of birds, fish and mammals, but to what extent are these perceived consequences really the result of climate change? A basic guiding principle for

GEM program development and implementation is that the nature-nurture enigma can only be resolved through analysis of long time series of appropriate physical and biological measurements.

The ability to measure global climate change and to understand its possible roles in biological production in the North Pacific has increased dramatically in the past decade. The climate of the North Pacific is known to change fairly sharply over periods of decades, centuries and millennia, in concert with climatic processes in other parts of the world, such as the north Atlantic. Some of these changes have been correlated through time with sharp changes in production and relative abundance of species of sea birds, salmon and other fishes, marine mammals, shrimp and crabs (see Section IV). The timing of changes in climate also appear to coincide with changes in the production and species composition of the plankton on which all these species feed, directly or indirectly. That mechanisms of biological production respond directly to the physical forces of climate change is known as the bottom-up control hypothesis, because climatic effects are thought to start at the bottom of the food chain and work their way up.

Global climate change is important for understanding how humans impact biological production. Is global climate change solely responsible for the ups and downs of the animal populations humans use and manage? Long-term population declines are apparent in animal populations that depend on the ecosystems of the Gulf of Alaska (GOA) such as cormorants, kittiwakes, fur seals, Steller sea lions, harbor seals, red king crab, and sablefish, among others (see Section IV). Are these declines the result of bottom-up control forced by climate change, or are they due to top-down control through removals of breeding animals and prey species by fisheries, mortality and depression of reproduction by oil and other pollutants, alteration of critical habitat and other human activities, or is it some complex interaction of both? Some populations that show long time trends, up or down, or sharp rapid changes in abundance, are actively managed through harvest restraints, such as fish (salmon, sablefish, pollock, halibut, arrow tooth flounder, Pacific Ocean perch) and marine mammals (seals, sea lions, whales, otters). The extent to which harvest restraints may be effective in establishing or altering trends in abundance of exploited species can only be understood within the context of climate change.

E. Fishery and Ecosystem Management

Understanding the concerns about the effectiveness of fishery management and the need to implement ecosystem management is key to making the GEM program responsive to resource management agencies and the public. Circumstances have converged to raise serious questions about the effectiveness of fishery management, and to raise demands to expand fishery management into ecosystem management. On a worldwide basis, many fisheries are fully exploited or depleted, and pressures on marine fisheries resources are increasing and are expected to increase further as human

populations increase. Within the North Pacific, all living marine resources on the high seas off Alaska except halibut were subject to very heavy and unregulated exploitation by international fishing fleets until the mid-1970's. Starting at various times in the mid-1970's and 1980's, steep declines have been noted in the Bering Sea and Gulf of Alaska in populations of fur seal, harbor seal, murres, kittiwakes, and the Aleutian Island pollock. Declines in Steller sea lion were serious enough for the species to be listed under the U.S. Endangered Species Act in 1990.

A combination of state, federal and international laws and agreements developed between 1923 and 1976 brought all marine fisheries within 200 miles of the Alaskan coast under protection of state and federal harvest limitations, and some limitations on harvests were extended beyond 200miles. Are the current fishery management programs, so recently imposed, going to be sufficient to allow sustainable human use of Alaska's living marine resources? Fishery management programs for single species such as Pacific halibut and Bristol Bay sockeye salmon, have been instrumental in sustaining human use over multiple human generations. On the other hand, the recent collapses of other regulated marine fisheries in Alaska and elsewhere have led to a growing realization that the management of a fishery is not the same as management of an ecosystem. Regulatory programs were in place at the time of collapse of the fishery for red king crab in the Gulf of Alaska, the fisheries for coho salmon off southern British Columbia and Oregon in the northeastern Pacific, and the fishery for cod on Georges Bank in the northwestern Atlantic, to cite but a few of the many available examples. It appears that factors beyond the scope of single-species management approaches can cause fishery management programs to have unintended consequences, such as contributing to the decline of the managed species.

As a consequence of the checkered history of fishery regulatory efforts, there continue to be serious concerns among scientists and the public about how fishing of all kinds may impact species being intentionally and unintentionally harvested, as well as the functioning of the ecosystem as a whole. Fishery management has a history of use of single-species models that do not account for the ecosystem , or groups of similar species. Even in the case of sustainable single-species fishery management, the supporting models often do not account for the ecosystem, except as a constant source of food or predation, and hence cannot explain sudden collapses. For example, managers did not anticipate the collapse in the Bristol Bay sockeye salmon fishery of 1998. Consequently, our inability to understand the reasons behind changes in the productivity, diversity and functional relationships in large ecosystems ultimately limits the use of current fishery models to making short-term predictions during periods of stable oceanic and climatic conditions.

So what is ecosystem management and why would it be an improvement over fishery management? Understanding the functioning of the ecosystem as a whole is a basic requirement of ecosystem management. Ecosystem management requires a functional understanding of the dynamics of the ecosystem – knowledge of how the

system produces the valued resources and what must be conserved to sustain healthy populations and a robust ecosystem. Unfortunately, available information appears inadequate to answer even the most basic ecosystem management question of whether the loss of upper-trophic-level-carbon through removal of catches of target and non-target fish species serves to reduce the long-term productivity of the ecosystem.

The case has been made in the scientific literature for climate-driven control of groundfish, salmon, seabird and crab populations in the northeast Pacific (see section IV). Indeed, examples are available to indicate that management of all species associated with the marine waters of Alaska would benefit from improved application of ecological knowledge to their management. For example, in the 1970s several species of pandalid shrimps dominated the shelf ecosystem as sampled by bottom trawls in the northern Gulf of Alaska. Suddenly, starting in about 1977, the shrimp were replaced by flatfish and cod-like fish in the mid-trawl catches. Such an abrupt change inevitably gave rise to questions about the role of fishing in the decline and the extent to which natural changes in the ecosystem made the shift inevitable. We do not have clear answers to these questions. If it had been known in the 1970s that the pelagic fisheries could be expected to undergo long-term cycles on the scale of 20 years or more, then their managers may have altered harvest strategies and the harvesters might have been better prepared for the economic consequences.

Ecosystem management is under development. Since 1995 the North Pacific Fishery Management Council, which manages, or coordinates management with the State of Alaska, in all marine waters of Alaska has received a statement of "ecosystem considerations" in its annual status report on groundfish populations in the Bering Sea, Aleutian Islands and Gulf of Alaska. Ecosystem management may be in its infancy, but it is widely being recognized among professionals as the heir to fishery management (see NPFMC 1999).

Given the limited state of current knowledge on ecosystem management and the precipitous declines in species of interest, it is prudent for regulators and the public to be wary of the potential for harvests of a single species to directly and indirectly effect the rest of the ecosystem, including other fish, seabirds, marine mammals, benthic communities and habitats. It seems reasonable to conclude that the combination of direct and indirect effects of fishing must in some way change ecosystems, but the magnitude and direction of these effects is largely a matter of speculation. Given the limitations imposed by current knowledge, it is also reasonable and prudent to be skeptical about the ability to sustain Gulf of Alaska fisheries over the long-term without better information. Lack of information is probably the greatest source of concern.

F. Marine Habitat Protection

The management and conservation of habitats in the marine environment is not well advanced compared to such efforts in terrestrial environments. For instance, in the oil-spill area the protection of about 650,000 acres of upland habitats by the Trustee Council is in addition to the protections available to large areas of land already in public ownership. With the exception of a few cases where tidelands are privately owned, marine habitats cannot be purchased as uplands can be. An additional problem is that relatively little is known about which areas are important to which species and at what seasons. The life histories and habitat requirements of many marine species are not well understood, making it difficult to develop appropriate conservation and management strategies.

Protection has already been afforded to marine habitats in some cases by excluding gear types that are thought to be injurious to habitat. For example the eastern GOA is now closed to trawling and dredging to protect crabs and their habitats. In addition there are numerous trawl and dredge closure areas in the vicinity of Kodiak, the Alaska Peninsula and Aleutian Islands. Marine areas containing marine mammal feeding grounds and adjacent to haul-out areas have also been closed to commercial fishing in parts of the Bering Sea, Aleutian Islands and Gulf of Alaska. Given the amount of marine habitats already subject to closure, more information on how to define critical marine habitats is essential to balancing fishing opportunities and protection of habitat.

While lack of information plagues even the discussion of marine habitat protection, there seems little question that pressure on marine habitats will continue to increase. For example, the impending road connection between Anchorage and the Prince William Sound port of Whittier is expected to vastly increase public visitation to northwestern Prince William Sound. The Whittier road is expected to generate increases in requests for permits for facilities (e.g., boat fuel and other supplies) on shorelines, tidelands, or nearshore waters and other potential actions that may impact marine habitats and the fish and wildlife populations that rely on these habitats.

Some sensitive locations and seasons are easily recognized, such as during the breeding season at well-documented seabird nesting colonies, but many other information needs are poorly satisfied. For example, through the Trustee Council's restoration program's large-scale ecosystem projects, we are starting to understand the full annual cycle of the Pacific herring, including identification of over-wintering habitats and requirements for juvenile herring. This type of information is crucial to long-term protection of herring stocks. There is much more to be learned about the habitat requirements of herring, to say nothing of other forage fishes, such as capelin and sand lance, which are key to healthy seabird and marine mammal populations.

G. Contaminants, water quality and watersheds; food safety

The presence of industrial and agricultural contaminants in aquatic environments has resulted in worldwide concerns about potential effects on marine organisms and on human consumers. Polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and organochlorine pesticides, such as DDT and its derivatives, are widely distributed around the world in marine and coastal waters and in the rivers and watersheds that feed freshwater into these environments. Such pollutants can be transported great distances by winds and ocean currents following their accidental releases from industrial and agricultural sources. In addition, mercury and other metals, such as inorganic arsenic, cadmium, and selenium, are naturally present in the environment at low concentrations, but anthropogenic sources can contribute additional quantities to the environment.

The geophysical and climatologic characteristics of the northern Gulf of Alaska tend to protect much of this region from deposition of environmental contaminants. However, recent evidence of persistent organic pollutants and heavy metals accumulating in adult sockeye salmon in the gulf indicate that pathways do exist. (sockeye salmon work).

Some of these contaminants, such as PCBs and DDT, can bioaccumulate in living marine organisms. For example, research on killer whales following EVOS revealed that some marine mammal-eating transient killer whales sampled in Prince William Sound carry concentrations of PCBs and DDT derivatives that are many times higher than those in fish-eating resident whales. The sources and harmful effects, if any, of these contaminants are not known. It has been established, however, that these contaminants are passed from nursing female killer whales to their calves.

There is also concern about potential effects of contaminants on people, especially people who are heavily dependent on subsistence resources, such as fish, waterfowl, and marine mammals. At higher levels of exposure, many of the chemicals noted above can cause adverse effects in people. Following the oil spill, there was much concern about hydrocarbon contamination in subsistence foods, and sampling programs for food safety were sustained through 1994. There continues to be concern about food safety in relation to the oil spill and more generally among Alaskan Natives in coastal communities.

Little is known about the distribution and concentrations of contaminants in the northern GOA. The State of Alaska, for example, does not monitor environmental pollutants in the marine environment nor in marine organisms on a regular basis. Similarly, there is no ongoing program for sampling food safety in subsistence resources in coastal communities, although the oil spill provided the opportunity to sample subsistence resources in the affected areas. Subsistence food safety testing was conducted from 1989 through 1994 in conjunction with damage assessment and

restoration activities following the oil spill. In addition, restoration activities included a resource abnormality study, which provided an opportunity for subsistence users to send in samples of abnormal resources for examination by pathologists in federal fiscal years 1994 – 1996. The samples were not examined for hydrocarbons or other contaminants.

A small-but-systematic effort to gather data on environmental contaminants in the oil-spill area could provide valuable "early warning" information to local residents and other consumers, especially subsistence users, and alert scientists to contaminants that may affect fish and wildlife populations. A relatively low cost program to acquire samples of fish, birds and mammals from existing projects throughout the spill area for contaminants testing could help define the origin and extent of contaminants in the environment. Synthesizing the multitude of small and large efforts throughout the GOA would certainly be useful.

H. Community involvement, traditional knowledge, education and stewardship

Residents of coastal communities have a direct interest in scientific and management decisions and activities concerning the fish and wildlife resources and environments on which they depend for their livelihoods and sustenance (Huntington 1992). While many residents have a great deal of historical and contemporary experience with and knowledge of the marine environment and resources, that information is often not documented, communicated, or used (Brown-Schwalenberg et al. In press). The failure to recognize and make use of local expertise has often caused a great deal of frustration among community residents. When the people affected by management and conservation actions are involved in designing and carrying them out, those actions are likely to be better focused and more effective (Huntington 1992, 1998a). Encouraging community involvement in making decisions, documenting and using traditional and local knowledge, and educating young people and community residents are important elements in the long-term stewardship of coastal and marine resources.

I. Coordination, Synthesis, and Information Transfer

There are many different programs and projects that involve monitoring, research, and management of marine resources in the Gulf of Alaska. These programs and projects are carried out by government agencies, such as the National Marine Fisheries Service, by universities, such as the University of Alaska, and by international bodies, such as the International Pacific Halibut Commission. Among these agencies and institutions, missions, responsibilities, and priorities vary by program and project, yet each of them concerns the study, management or conservation of marine resources in the gulf. There is potential for overlap and duplication among these programs and projects, but probably a more serious concern is a lack of coordination and integration, which means foregoing opportunities for increased efficiency, focus, and joint action that would benefit marine

resources and stakeholders. Thus, there is both need and opportunity for coordination, joint planning and setting of priorities and program details, such as cruise schedules.

A second, related problem arises from the fact that multiple programs gather data on marine resources in the GOA but there is little integration and synthesis of the results. The resulting lack of broad context can make interpretation of individual data sets problematic or inaccurate. Further, lack of integration and synthesis prevents natural resource managers and stakeholders from obtaining a "big picture" perspective on what is happening in the GOA.

A third problem is the difficulty in communicating results in useful ways to people who would benefit by having the information. Although the scientific literature is an effective means of disseminating research results within academic circles, journals are generally not an effective way to share information with natural resource managers and stakeholders, who often lack time, ready access, or training to make use of the information available in technical journals. Thus, there is need to convey the interpreted and synthesized results of monitoring and research projects to managers and stakeholders in a timely, accessible, and understandable manner. Lack of an effective mechanism or mechanisms to do so can compromise the success of a program like GEM.

II. Vision for Gem and Northern Gulf of Alaska

A. Mission

The mission of the Gulf Ecosystem Monitoring (GEM) program is to foster a healthy and biologically diverse marine ecosystem in the northern Gulf of Alaska through greater understanding of how its productivity is influenced by natural changes and human activities. In pursuit of this mission, the GEM program will sustain the necessary institutional infrastructure to provide scientific leadership in identifying research and monitoring gaps and priorities; sponsor monitoring, research, and other projects that respond to these identified needs; encourage efficiency in and integration of Gulf of Alaska monitoring and research activities through leveraging of funds, interagency coordination and partnerships; and involve stakeholders in local stewardship by guiding and carrying out the program.

B. Goals

Specific programmatic goals are to:

- track lingering oil-spill injury, as needed;
- detect and understand annual and long-term changes in the marine ecosystem, distinguishing natural variability from human influences;
- improve fish and wildlife management through the development and application of new information and technologies;
- provide integrated and synthesized information on the status, trends and health of fisheries, seabirds, marine mammals, and other marine resources;
- provide baseline information on water quality and on contaminants in fish and wildlife consumed by people; and
- support the identification of important marine habitats and of basic life history and habitat requirements of marine species.

Specific institutional goals are to:

- identify research and monitoring gaps currently not provided by existing programs;
- leverage funds from other programs;
- set priorities for research and monitoring ;
- synthesize research and monitoring to advise setting priorities;
- keep track of work relevant to understanding biological production in GOA

C. Geographic Scope

Consistent with the Trustee Council's November 1994 *Restoration Plan*, the primary focus of the GEM program is within the oil-spill area, the northern GOA, including Prince William Sound, Cook Inlet, Kodiak and the Alaska Peninsula (Fig. 1). Recognizing that the marine ecosystem impacted by the oil spill does not have a discrete boundary, some monitoring and research activities will necessarily extend into adjacent areas of the northern GOA. Partnerships with other funding sources will also allow participation in projects having geographic boundaries outside the northern GOA.

D. Funding potential

The intent of the Trustee Council is to fund the GEM program beginning October 2002 with the funds allocated by the Trustee Council for long-term research and monitoring, estimated to be approximately $115 million. The Trustee Council intends to manage these funds as an endowment, with the annual program funded by investment earnings. Currently, the *Exxon Valdez* Oil Spill settlement funds are required by federal law to be invested in the U.S. Treasury, and specifically by the terms of the court order, within the Court Registry Investment System in the U.S. Treasury. This requirement seriously restricts the investment potential of the fund. The average Treasury Bill rate for the past five years has been approximately five percent. Given a $115 million corpus, the fund could be expected to have approximately $5.75 million available in interest earnings to fund the entire program, including administrative costs. This would likely preclude the Trustee Council's ability to inflation-proof the fund, or to allow other scenarios that would allow the corpus to grow.

The Trustee Council is in the process of seeking legislative relief in Congress from the investment restriction in order to allow the funds to be invested in a prudent manner. Similar endowments such as the State of Alaska Permanent Fund, the State of Alaska retirement fund, the University of Alaska Foundation and others earn on average considerably more than five percent per annum, yet are still invested in a prudent manner. Given the past record of the stock market, investment returns of 18-20% and higher are typical. However, even before this, most foundations were averaging 8-10% rate of return. This size of a return would allow the Trustee Council to inflation proof the fund. For example, an 8% rate of return on a $115 million fund, would realize $9.2 million in earnings. Assuming a 3% inflation rate, $3.45 million would go towards inflation proofing, with $5.75 million available to spend. In five years, with inflation proofing, $6.47 million would be available to spend. This investment scenario would allow for a stable program over time. The Trustee Council would also have the option of funding a more reduced program in the early years in order to build the corpus.

It is also the long-term goal of the Trustee Council to have the research fund established in such a manner to allow for additional deposits and donations to the fund

from other sources in order to increase the corpus. This would likely take some form of state and/or federal legislation, and possibly a change in the consent decree.

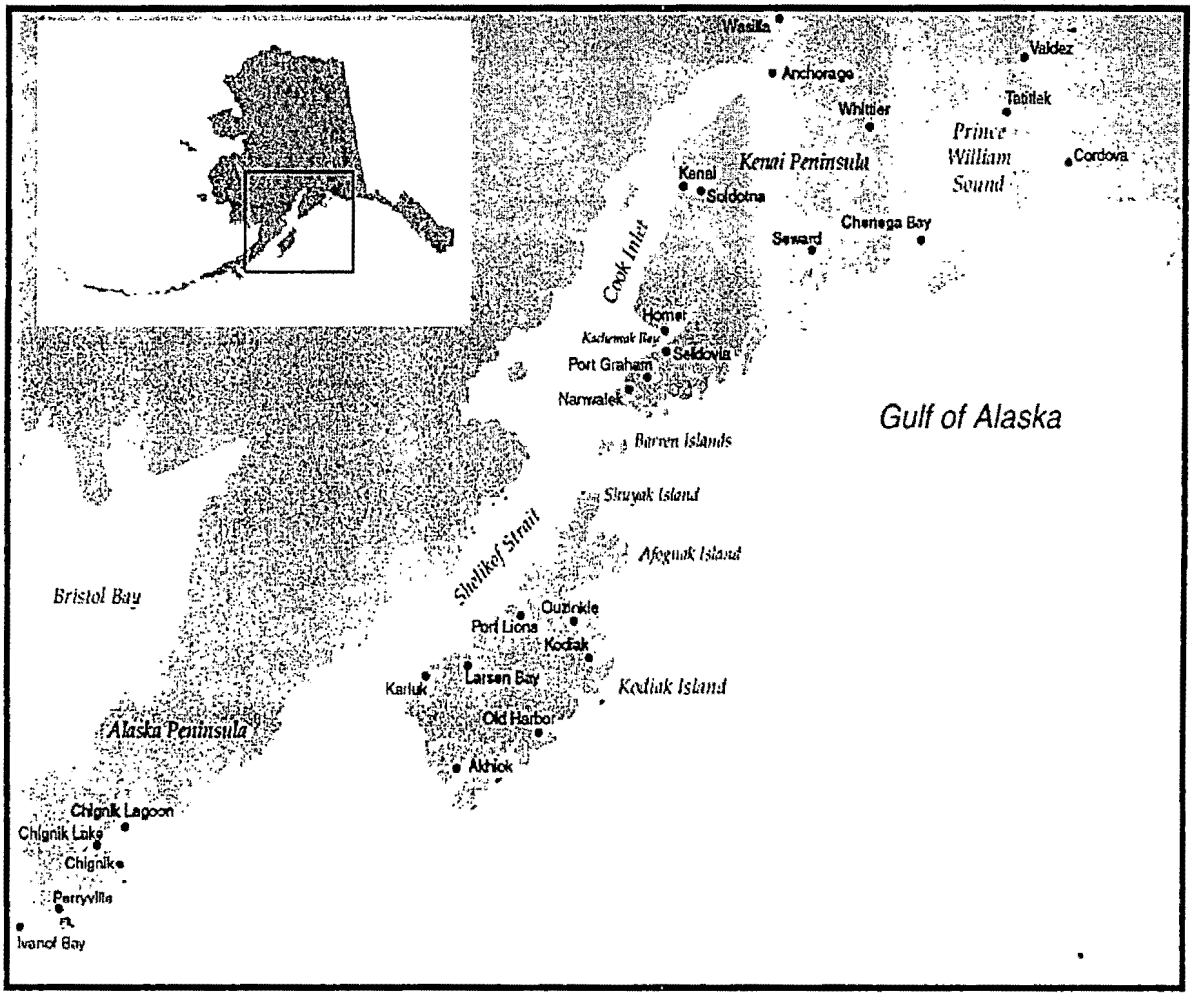
E. Governance

Under existing law and court orders, three State and three federal trustees were designated by the Governor of Alaska and the President to administer the restoration fund and to restore resources and services injured by the oil spill. The State of Alaska Trustees are the Commissioner of the Alaska Department of Environmental Conservation, the Commissioner of the Alaska Department of Fish and Game, and the Attorney General. The federal trustees are the Secretary of the Interior, Secretary of Agriculture, and the Administrator of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

The Trustees established the Trustee Council to administer the Restoration Fund. The state trustees serve directly on the Trustee Council. The federal trustees have each appointed a representative in Alaska to serve on the Trustee Council. These currently are the U.S. Interior Department's Special Assistant to the Secretary for Alaska; the Alaska Director of the National Marine Fisheries Service; and the Supervisor of the Chugach National Forest for the Department of Agriculture, although this position in the past has been held by the Alaska Regional Forester. All decisions by the Trustee Council are required to be unanimous. It is expected that the current Trustee Council will continue to make policy and funding decisions for the GEM program.

It has been suggested that at some time in the future a new board or oversight structure could be established to administer or guide the research and monitoring fund. It is also possible that an existing board, either under its current structure or with minor modifications, could take over management of the fund. However, use of a new governance structure would require changes in law and the applicable court decrees, and it is not anticipated in the near future. Any change in governance would need to be justified.

FIGURE 1. MAP OF THE OIL SPILL AREA



III. Structure and Approach

The GEM scientific program will consist of two main complementary components: long-term ecological monitoring and shorter-term targeted research. Ā core of long-term monitoring measurements are intended to track ecosystem changes on the scale of decades. Shorter term research will be used to clarify functional relationships within the ecosystem. The GEM program will be designed, carried out, and evaluated with the benefit of independent scientific peer review and the participation of natural resource managers, stakeholders, and residents in coastal communities. The selection, design, and execution of projects will be coordinated with and complementary to ongoing programs and projects of government agencies and other institutions. The use and application of traditional and local knowledge will be encouraged, as will the participation and education of young people in coastal communities. The synthesis, interpretation, and dissemination of what is learned about the status, trends, management, and conservation of marine resources will be a priority throughout the program. Periodic "State of the Gulf" workshops, invitations to submit proposals, and reports to the public will be part of GEM's adaptive management process and means for public outreach.

A. Long-term Monitoring

The core of GEM is long-term ecological monitoring to document productivity and seasonal, interannual, and interdecadal changes in the shelf and coastal ecosystems of the northern GOA, including PWS, lower Cook Inlet, and the Kodiak Archipelago-Shelikof Strait area. Monitoring productivity in relation to ecological changes will lead to an understanding of the influences on the health and productivity of key species of fish and wildlife and will improve the ability to distinguish natural and man-made causes of change and predict ecological trends. In turn, this information can be applied by a variety of stakeholders for the use, management, and conservation of marine resources.

The monitoring program will be designed to test scientific hypotheses over the time scale of a century. Because funds are limited, GEM must take advantage of existing, ongoing programs and projects carried out by federal and state agencies and other institutions. Trustee Council funds will be used to support core measurements that are essential to taking the pulse of the northern GOA and that are not being obtained reliably on a sustained basis through other programs. In addition, GEM will supplement existing programs and projects, taking additional measurements to obtain the necessary spatial and temporal coverage. Individual monitoring projects will be awarded on a competitive basis and carried out under long-term commitments by the most appropriate and qualified persons from government agencies, universities, and the private sector.

Monitoring data from GEM will be analyzed and integrated into predictive ecosystem models. Synthesized results will be shared with stakeholders and the public

through periodic "State of the Gulf" workshops and reports. As information becomes available, it will be accessible via the Internet. The design and results of GEM monitoring will be scientifically peer reviewed and the program fine-tuned accordingly at five-year intervals. Results from the research program should inform the monitoring program, so that it may be changed or augmented to reflect the most accurate, up-to-date understanding of the functional processes that should be monitored and the technologies available to monitor those processes. There will always be a dynamic balance between the need for continuity and making the monitoring program most reflective of our latest understanding of how the system functions and where and when it is best measured.

B. Shorter-term Focused Research

The long-term monitoring element of GEM will be complemented by strategically-chosen research projects with relatively short-term goals. This research will have several primary purposes. These purposes are to:

- follow up on issues related to any lingering effects of the *Exxon Valdez* oil spill;
- explore questions and concerns that arise out of interpretation of the monitoring data, and
- provide key information and tools for management and conservation purposes (including determining basic life histories and identification of important areas, habitats, and ecological processes).

It is premature to identify specific projects to be carried out in the research component of GEM. It is possible, however, to discuss the types of research that will be carried out and to offer specific examples of potential projects.

1. Lingering injury from the oil spill

Research specifically related to the effects of the *Exxon Valdez* oil spill may be prominent in the first few years of the GEM program, but the need for this type of research will likely diminish over time. Types of research likely to be conducted include exploring the effects of hydrocarbon exposure on the survival and reproduction of fish and wildlife resources and the identification of pathways of such exposure. For example, if contaminants monitoring indicates the induction of P450 enzymes in harlequin duck livers in response to exposure to petroleum hydrocarbons, a two-pronged research approach might be to determine whether the survival or reproduction of harlequin ducks is compromised by the exposure to hydrocarbons and to identify the pathway of exposure, such as through oiled mussel beds or other forms of residual shoreline oiling. Another example would be to explore interactive effects of ocean conditions, disease, and

exposure to petroleum hydrocarbons on Pacific herring. There also may be need to carry out some general restoration projects, such as small-scale fisheries enhancements (e.g., stream-channel improvements), that relate directly to restoration of EVOS injury.

2. Exploring questions with or generated by monitoring data

As the effects of EVOS fade and as GEM matures, research projects will increasingly arise from the results and needs to improve the long-term monitoring program. Many different types of research may arise by this means. Some of this research will involve special analyses and modeling of data obtained through the core monitoring program (including current and retrospective data). Other projects, such as those exploring mechanisms of change or ecological processes, will require additional work in the field or laboratory. Several examples will help frame the types of research projects that may be appropriate.

For example, the results of GEM monitoring may indicate correlations between certain climatic and physical oceanographic processes. This correlation between climatic and oceanographic processes then can be explored in depth through retrospective analyses of GEM data and a predictive model can be constructed. It may then be necessary to supplement regular GEM measurements with special measurements in the field in order to more fully resolve the nature of the relationship and the mechanism involved. If successful, this type of research might deliver increased predictive capability for both users and managers of marine resources, such as for commercial fisheries.

As another example, data from GEM may indicate that fundamental environmental changes are occurring, such as changes in ocean temperatures. It is known that such changes can have major impacts on the biological composition of the ecosystem (e.g., increases in bottom fish and reductions in crustaceans), but it may not be clear whether the origin of the environmental change is natural or anthropogenic, and the mechanisms of the biological effects may not be known. Analyses of GEM monitoring data should help researchers tease apart whether the environmental changes are cyclic or the result of global climate warming related to man's activities, and research in controlled settings may help identify the mechanisms by which changes in ocean temperature actually affect living organisms (e.g., disruption of reproductive cycle). Both types of research will help resource managers and stakeholders better understand, predict, and possibly respond in some way to environmental change in the northern GOA.

3. Management and conservation

Finally, GEM research may include projects designed to provide information and tools to improve management and conservation of marine resources. Examples of this type of research would include improving techniques, tools, or technology for stock assessments of fisheries resources, gathering basic information on species life histories,

genetic stock identification of marine mammal, seabird, or fish populations, and experimental work on the ecological effects of different levels, locations, and seasons of fisheries harvests.

The Trustee Council's habitat protection program has focused on the terrestrial habitat of numerous marine species by protecting about 650,000 acres of upland habitats, including 1400 miles of shoreline and 300 anadromous fish streams. Research carried out as part of GEM can be focused on the identification of sensitive areas and seasons in the marine environment so that this information can be considered in the development of management and conservation strategies in the marine environment.

C. Traditional Knowledge, Community Involvement and Local Stewardship

The Trustee Council believes that encouraging local awareness and participation in research and monitoring enhances long-term stewardship of living marine resources. Traditional and local knowledge can provide important observations and insights about changes in the status and health of marine resources (Huntington 1998b). Community involvement is needed to document and design applications of traditional and local knowledge to research and monitoring projects. The inclusion of appropriate traditional and local knowledge and the involvement of communities in the northern GOA region is appropriate throughout the GEM program. Local monitoring, documentation, and stewardship projects must be linked wherever possible with other monitoring, research, and conservation projects under GEM to promote sharing of information and ideas. Scientific steering committees, composed of academic, agency and local representatives, can identify and oversee opportunities for productive collaboration. The "State of the Gulf" workshop and other forums can bring together a variety of participants in the various aspects of GEM to stimulate discussions and spark new ideas.

The actual mechanisms for achieving this goal are not fully developed. Several approaches have been tried in the EVOS restoration program and elsewhere in Alaska and other northern regions, and GEM will draw on these experiences to design specific processes for involving communities and their expertise (Brown-Schwalenberg et al. In press; Huntington, In press; Fehr and Hurst 1996; Hansen 1994; Brooke 1993). One approach, the Youth Area Watch, has proven to be an effective and popular means of involving and educating young people and their home communities about EVOS research. Similar projects may be developed as part of GEM in coastal communities throughout the oil-spill area.

D. Science Management

By necessity, the administration and management of GEM must be cost efficient. Equally important, however, is the need for a high caliber scientific program. To this end, a senior staff scientist will serve on the Trustee Council staff and work with the

executive director, Trustee Council, the scientific community, natural resource agency managers, and stakeholders to implement and evaluate GEM. Independent peer review, mostly on a volunteer basis, will be vital to the process. Special review panels may be convened to critique particular aspects of the program. Periodically, the entire program will be reviewed for the quality of its science and its benefit to the public with respect to its mission. The program will function within an adaptive management cycle, including a "State of the Gulf" workshop, an invitation to submit proposals for the coming fiscal period, peer and public review, Trustee Council action, and reporting on recent results. The period for the adaptive management cycle is to be determined.

1. Principles and Policies

The GEM program will be administered consistent with policies adopted by the Trustee Council and set forth in the November 1994 *Restoration Plan* (pp. 11-18). In general, these policies can be characterized as follows: Competition for restoration funds is encouraged, and priority is given to strategies that involve partnerships. Projects are subject to open, independent scientific review, and restoration must include meaningful public participation, including the synthesis and dissemination of project results. Finally, consistent with the November 1994 *Restoration Plan*, it is the intent of the Trustee Council to not fund projects that are considered "normal" activities of government agencies.

Specifically with respect to management of the scientific aspects of GEM, the following additional principles and policies are proposed as germane:

a. The geographic scope of the program will focus on the spill area as defined in the *Restoration Plan* (Fig. 1). Some monitoring and research activities, however, will extend more broadly in the northern GOA in order to encompass important climate, oceanographic processes, and biological phenomena.

b. The program will be designed and operated as a long-term endeavor. Monitoring projects will be designed on long time scales, but will reviewed at 5-year intervals. Research projects and other activities will be reviewed annually or biennially. Adaptive management on an appropriate time scale is essential, and periodic review by an outside entity, such as the National Research Council, may be appropriate.

c. The program will be administered by a core professional staff that is not directly affiliated with any particular agency, institution, or program, as is currently the case with management of the Exxon Valdez Oil Spill Restoration Office.

d. Monitoring and research activities must be of the highest scientific caliber, with ongoing outside peer review and participation by the best scientists from a variety of institutions. Funds for monitoring and research projects will be awarded on a competitive basis.

e. Over the long term, the results of the program must be useful to natural resource agencies, stakeholders, and the public, who also must be involved in its design, evaluation, and application.

f. The program should take advantage of different institutions, facilities, and capabilities throughout the region. These institutions should contribute expertise, services, and funds toward programs and projects that support GEM's mission. In some cases, these institutions will receive funds to carry out elements of the program. Efforts to share costs should be encouraged and rewarded.

g. To the maximum extent possible, the program will be coordinated and directly coupled with both ongoing and limited-duration monitoring and research endeavors that support GEM's mission. However, the program will strive to carry out work that cooperating institutions are not capable of or are unable to carry out.

h. Overall, the program aims to serve as a vehicle for jointly evaluating, setting, carrying out, and synthesizing marine science priorities and results in the northern GOA, with links, as appropriate, to work in other parts of the north Pacific (e.g., Bering Sea).

i. All projects must be carried out on a cost-effective basis, and there must be public access and accountability in regard to all projects and project results.

j. Participation by students and local residents will be actively encouraged.

k. Data and biological or other samples obtained through GEM and cooperating programs must be archived and maintained subject to appropriate standards and readily accessible to the scientific users and the public.

l. Finally, the results of the program must be analyzed, interpreted, synthesized, and disseminated on a regular basis for the benefit of resource managers, stakeholders, the wider scientific community, and the public.

2. Proposed elements of GEM science management

a. Scientific leadership and peer review

A senior staff scientist, hired by the executive director and residing in Alaska, will provide in-house scientific counsel and leadership to GEM and the Trustee Council. Over time, but probably not initially, the senior scientist may serve as executive director of the Trustee Council. The senior scientist will work with the Trustee Council and executive director, in consultation with the scientific community, natural agency managers, and stakeholders, to plan, implement, and evaluate the long-term program.

One means of obtaining the needed consultations will be the public advisory group, which is required under the terms of the settlement. The composition and nature of this group with respect to long-term implementation of GEM needs further consideration.

Independent peer review will be an essential feature of the GEM process, and there are different models for managing this process. For example, the process could be managed entirely by the senior staff scientist or it could rely more on the services of a consulting science advisor. Regardless, there will be an external *ad hoc* technical review process, the primary purpose of which will be to provide rigorous peer review of the scientific merits of all monitoring and research proposals and selected reports. Such reviews will be sought on a mostly voluntary basis from qualified scientists who are not also carrying out projects funded by the Trustee Council. In general, the individuals involved will change as topics, needs, and availability change. Review functions will be carried out in writing, by telephone, and occasionally on site or in person. From time to time, special review panels will be convened to evaluate and make recommendations about aspects of the program.

b. Process

Starting in FY 03, the basic process will function on an adaptive management cycle along the lines of the current restoration program. This process will have the following elements or steps:

-A periodic "State of the Gulf" workshop at which the results during the previous cycle are discussed, information is integrated across disciplines, and needs and opportunities for the next year are considered. Project investigators, selected peer reviewers, resource managers, stakeholders, and the public are invited to this meeting.

-A periodic *Invitation to Submit Proposals*, which will specify the types of proposals that are priorities for consideration in the coming fiscal period. Research proposals are envisioned to be of finite duration and to have short-term goals (e.g., 2-5

years). Monitoring projects will be evaluated and renewed on longer time scales (e.g., once every 5 years) and any given *Invitation* may or may not invite proposals for new or ongoing projects. The *Invitation*, however, will be the vehicle for notifying the scientific community and others that monitoring projects will be considered in a given fiscal year. The Trustee Council must annually approve funding for each monitoring and research project, although revised project proposals would not necessarily be required each year.

-Proposals received in response to the *Invitation to Submit Proposals* will be circulated for *ad hoc* peer review. Peer review comments and recommendations will be summarized and provide a basis for preliminary recommendations on the projects included in annual work plans.

-The executive director will prepare a draft annual work plan to advise the annual fiscal program of the Trustee Council. The draft annual work plan will be circulated for public review and comment. Following close of the public comment period, the executive director will prepare final recommendations on the annual work plan for consideration and action by the Trustee Council.

-Annual and final reports will be required for all monitoring and research projects, and all such reports will be reviewed to evaluate whether the investigators are making satisfactory progress toward project objectives. Selected annual reports may be sent for comment by independent peer reviewers, depending on need, the maturity of the project, and other factors. All final reports will be sent for outside peer review, and comments from the independent peer reviewers must be addressed in the final versions of final reports. All annual and final reports will be archived at the Alaska Resources Library and Information Service (ARLIS) and affiliated institutions.

- Publications in peer-reviewed literature are expected of program participants

- From time to time, special peer review panels may be convened to meet with project investigators and others in workshop formats to fully explore particular topics, problems, or projects. These sessions may involve evaluations of projects that have been completed or are in progress, interpretation and synthesis of data, and explorations of potential future work.

c. Coordination with other programs and projects

Coordination with other programs and projects is absolutely essential to the success of GEM. GEM is being designed to supplement and support existing science programs. Another key to success is identifying and filling gaps in existing monitoring programs, identify key research priorities, and help foster research and monitoring projects within other agencies and institutions that are in concert with the GEM mission. In developing the GEM program, substantial effort has gone into identifying the relevant

scientific agencies and their present and historical scientific databases (see IV. B. Existing Agency Programs and Projects and Appendix Table 1).

E. Data Management, Synthesis and Public Information

Development of detailed plans to address needs in the areas of data management, synthesis, and public information will require additional time and resources. In the interim, however, the basic approaches to meeting these needs can be outlined as follows. Development of a policy on data, including its storage, publication and chronology of distribution is a key task that needs to be completed prior to funding of projects.

1. Data Management

The current EVOS restoration program does not have an overarching data management strategy or plan, although some individual projects (e.g., Sound Ecosystem Assessment) have had sophisticated systems for managing and exchanging data. The investigators for each project sponsored by the Trustee Council are responsible for preparing written final reports, which must describe the data obtained in the project and the format of the data, identify the permanent custodian of the data, and indicate the availability of the data. The final reports containing the data summaries are available from the Alaska Resources Library and Information System (ARLIS) 907-272-7547. With respect to data on hydrocarbons, copies of all such data are reviewed and then archived in a hydrocarbon database maintained at the National Marine Fisheries Service Auke Bay Laboratory in Juneau, Alaska. In addition, it is the policy of the Trustee Council that, consistent with state and federal laws, any data resulting from any project to which the Trustee Council has contributed financially are in the public domain and as such must be available to the public.

It is absolutely essential that data management needs for GEM be addressed fully before gathering of new long-term monitoring data is initiated. To the extent that GEM will incorporate existing data sets, it also is essential that provision is made to seamlessly link existing and new data. As preliminary steps, it will be necessary to:

- review existing EVOS policies and practices with respect to data management at programmatic and project levels;
- compile detailed information about the location and status of data sets ("metadata") for at least those projects that are likely to be relevant to GEM; and
- assess federal and state agency data management policies and standards, practices, and programs to identify requirements that pertain to GEM and opportunities to address GEM data management needs on

a cooperative basis with Trustee agencies or other appropriate agencies and institutions.

On the basis of these preliminary steps, we will then develop a draft data management plan and policy. A research project under Dr. Charles Falkenberg was initiated in FY 00 deal with the data management issues issues described in this section. The fundamental aim of the plan will be to ensure that GEM data, especially long-running streams of monitoring data, will be maintained and archived in ways that are permanent, cost effective, technically appropriate, and readily accessible to scientific users, resource managers, stakeholders, and the public.

The GEM data policy will require individual investigators and sponsoring agencies and institutions to turn over all data in electronic formats and supporting documentation, consistent with applicable data standards, to a custodian agency or institution within a certain time after the data are obtained (probably within one year), at which point the data are available to all public users. Although different data sets may be archived and maintained at different agencies or institutions, depending on the subject, it is expected that such data will be available at a central GEM website via Internet links to other websites. Implementing the GEM data management plan and policy will require the services of a dedicated data manager, perhaps on a shared basis with a Trustee agency or other agency or institution.

2. Synthesis

In order for GEM to be successful, it will be necessary to integrate, synthesize, and interpret monitoring and research results to form and present a "big picture" of the status of and trends in the GOA ecosystem. There will be different ways that the necessary syntheses can be achieved, and different ways to convey this information to users. What is important is for the needed information to be conveyed in formats that are accessible to and useful for a variety of users, including scientists, resource managers, stakeholders, and the public.

One approach to synthesizing an array of ecological data is modeling. Useful models of 3-dimensional water circulation, plankton production, juvenile pink salmon survival, Pacific herring overwintering, the energetics of colony-nesting seabirds, and carbon mass-balances in Prince William Sound exist or are in advanced stages of development. These models show great promise as a means of integrating large volumes of data in a way that yields insights about how marine ecosystems work. These models also offer a means of identifying knowledge gaps or making predictions about climate forcing, oceanographic currents, biological productivity, and the ecological effects of human activities. The models cited above mostly address the Prince William Sound ecosystem. To the extent that these models relate to GEM hypotheses, it may be worthwhile to invest additional resources in further testing and application in Prince

William Sound or to extend their scope to other areas within the oil-spill region or to the northern GOA more broadly.

A periodic "State of the Gulf" workshop will be another means of reviewing and integrating information across disciplines to achieve greater insight into the status of and trends in the northern GOA ecosystem. At such forums, project investigators and others will present results and exchange information for the benefit of scientific participants, but also for the benefit of resource managers, stakeholders, and the public. The format will be similar to the annual restoration workshops in the current EVOS program. More targeted workshops may also be appropriate.

3. Public Information and Involvement

The importance of public participation in the restoration process was specifically recognized in the Exxon settlement and is an integral part of the agreement between the state and federal governments. The Memorandum of Agreement and Consent Decree approved by the court specify that:

> ...the Trustees shall agree to an organizational structure for decision making under this MOA and shall establish procedures providing for meaningful public participation in the injury assessment and restoration process, which shall include establishment of a public advisory group to advise the Trustees...

The Trustee Council is committed to public input and public outreach as vital components of the long-term GEM program. The question is how this should be achieved. The existing Public Advisory Group (PAG) has 17 members representing 12 interest groups and the public at large, as well as two ex officio members from the Alaska Legislature. It is probably appropriate that the makeup of the PAG be changed to increase the participation of other interests and reduce costs. It is also possible that, public input could be sought without a formal advisory group, although this would require an amendment to the consent decree. The Trustee Council will likely develop a series of alternatives in the next two years and then go out for public comment before taking any final action prior to October 2002.

The Trustee Council is a public entity subject to the State of Alaska Open Meetings Act and corresponding federal laws. All meetings are public and include a formal public comment period. A number of additional tools have been developed in the past to promote and encourage public input and participation. These include newsletters, annual reports, public meetings in the spill-affected region, newspaper columns, a series of radio spots, and the Council's website at www.oilspill.ak.us.

Since the GEM program is envisioned as a much smaller program than the current *Exxon Valdez* Oil Spill restoration program, the costs of these outreach efforts has to be

considered before decisions are made on which tools are the best to increase public input and participation. Additionally, the audiences vary widely, and include the greater scientific community both in Alaska and outside the state, Native villages without internet access, high school and college students, fishermen, and federal, state and local government officials. Some tools are obviously more appropriate for specific audiences.

A major tool for disseminating data and interpreted and synthesized results from GEM projects to the public, stakeholders and the greater scientific community will be a GEM website. This site could be along the lines of the Bering Sea and North Pacific Ocean Theme Page (www.pmel.noaa.gov/bering), which is maintained by the National Oceanic and Atmospheric Administration. This website could provide access to GEM databases and other products (e.g., metadata and bibliographies of reports and publications), as well as present and discuss research results, program information, and evolving insights about the northern Gulf of Alaska marine ecosystem. Another example of an effective tool for facilitating data exchange of data and research is the North Pacific Marine Science Organization, PICES web site, (http://pices.ios.bc.ca/data/weblist/weblist.htm).

IV. Scientific Context

A. Guidance from Prior Programs

1. Comprehensive Investigations and Reviews

There are antecedents of the GEM program to provide guidance. A marine science planning effort with a broader geographic scope, the Alaska Regional Marine Research Plan, ARMRP (ARMRB 1993), was prepared under the U.S. Regional Marine Research Act of 1991. For all marine areas of Alaska, including the Gulf of Alaska, the Plan provided five elements that are of interest to the GEM program, 1) an overview of the status of marine resources, 2) an inventory and description of current and anticipated marine research, 3) a statement of short- and long-term marine research needs and priorities, 4) an assessment of how the research and monitoring activities under the Plan take advantage of existing projects, and 5) a descriptions, time tables and budgets of research and monitoring to be conducted under the Plan. The current GEM document does not address element 5, since that is the ultimate goal of the three-year process of implementation to be completed by October 1, 2002. ARMRP program goals express the scientific needs of the region as of 1992, and they are still quite relevant to the GEM effort:

- Distinguish between natural and human induced changes in marine ecosystems of the Alaska Region.

- Distinguish between natural and anthropogenic changes in water quality of the Alaska Region.

- Stimulate the development of a data gathering and sharing system that will serve scientists in the Region from government, academia, and the private sector in dealing with water quality and ecosystem health issues.

- Provide a forum for enhancing and maintaining broad discussion among the marine scientific community on the most direct and effective way to understand and address issues related to maintaining the Region's water quality and ecosystem health.

(ARMRB 1993, pages 13 – 14).

The Bering Sea has received a good deal of recent attention. Concern over long-term declines in populations of high-profile species such as king and tanner crab, Steller sea lion, spectacled eider ducks, common murres, thick-billed murres, red-legged and black-legged kittiwakes (DOI-NOAA-ADF&G 1998b). The vision of the federal-state regulatory agencies of the Bering Sea Ecosystem Research Plan (Draft, 1998a) is consistent with the mission statement of the Trustee Council (see Section II.A.), "We envision a productive, ecologically diverse Bering Sea ecosystem that will provide long-term, sustained benefits to local communities and the nation." (1998a, p. 5). The overarching hypotheses are consistent with the basic model of the GEM plan (see IV.D.2);

- Natural variability in the physical environment causes shifts in trophic structure and changes in the overall productivity of the Bering Sea

- Human impact leads to environmental degradation, including increased levels of contaminants, loss of habitats, and increased mortality on certain species in the ecosystem that may trigger changes in species composition and abundance

(DOI-NOAA-ADF&G 1998a, p. 9)

Further, four of the research themes of the Bering Sea Ecosystem Research Plan (DOI-NOAA-ADF&G 1998a), variability and mechanisms in the physical environment, individual species responses, food web dynamics, contaminants and other introductions are closely aligned with the mission basic mission established by the Trustee Council. Note that current research programs for the Bering Sea (DOI-NOAA-ADF&G 1997) often overlap with the programs identified in our survey for the Gulf of Alaska (Appendix A).

2. Scientific Legacy of the Exxon Valdez *Oil Spill*

The studies conducted by the trustee agencies and their contractors since 1989 have resulted in over 300 peer reviewed scientific publications, PhD dissertations and Master's theses (Appendix C). In addition to much specific information on the effects of oil on the biota in the spill area, the studies also provide a wealth of ecological information. The scientific legacy of the oil spill studies includes information on physical and biological oceanography, marine food web structure and dynamics, predator-prey relationships among birds, fish, and mammals, the source and fate of carbon among species, developmental changes in trophic level within species, marine growth and survival of salmon, intertidal community ecology, early life history and stock structure in herring, and much more.

In designing its approach to restoration, the Trustee Council recognized the need for basic ecological information. The recovery status of each affected resource (Table 1) is based to the extent possible on knowledge of the resource's role in the ecosystem, in addition to trends in abundance, evidence of continued exposure to oil and other data. It is the ecological knowledge gained in the decade following the oil spill that forms the foundation of the Gulf Ecosystem Monitoring program. Experience gained in compiling this scientific legacy points toward the need to understand the causes of population trends in individual species of plants and animals through time. Understanding the causes of population trends leads to the need to separate human effects from those of climate and interactions with related species.

B. Existing Agency Programs and Projects

1. Introduction

Most major government information gathering programs of the Gulf of Alaska (Appendix Table 1) are divisible into two major categories: large animals or macrofauna (birds, mammals, fish, shellfish) and oceanography (physical, chemical, geological and biological). Biological oceanography most often collects data on small plants and animals, the zooplankton and phytoplankton, and on primary productivity. Primary productivity, often measured as grams of carbon fixed per unit area per unit time, is a basic measure of biological activity. Notably absent are monitoring or assessment programs for large plants, such as kelp and other large marine algae. Sampling efforts for macrofauna are typically focused on the Gulf of Alaska or smaller areas, including Prince William Sound, Cook Inlet, Kodiak and the Alaskan Peninsula, whereas oceanography programs often include the Gulf of Alaska as part of a larger, often global program.

ADF&G, Department of Interior and National Oceanic and Atmospheris Administration and its National Marine Fisheries Service, NOAA/NMFS are the primary monitoring agencies for the macrofauna. National Aeronautics and Space Administration, NASA and NOAA's National Ocean Service, NOS, National Environmental Satellite, Data, and Information Service, NESDIS, National Weather Service, NWS, Oceanic and Atmospheric Research , OAR (Fisheries Oceanography Investigations, FOCI) are the primary sources of oceanographic data.

The projects presented in Appendix Table 1 are actively collecting data. Inactive projects should be included in the future because they contain considerable valuable historical information relevant to the production of plants and animals in the Gulf of Alaska. A summary of the major programs conducted by the United States, State of Alaska, and transboundary organizations follows.

2. US Department of Commerce, National Oceanic and Atmospheric Administration

National Marine Fisheries Service: . Major programs include the triennial trawl surveys for groundfish, becoming biennial surveys beginning in 2001, annual longline surveys primarily for sablefish and rockfish, and the Ocean Carrying Capacity program in the Gulf of Alaska with three cruises a year.

Centers responsible for monitoring within NMFS are the Alaska Fisheries Science Center, Northwest Fisheries Science Center, Southwest Fisheries Science Center, and the Alaska Region. Salmon and rockfish genetic stock identification are conducted at Auke Bay Laboratory, near Juneau, Alaska. Fishing vessel observer programs that collect biological information are conducted out of the Alaska Fishery Science Center in Seattle. Marine mammal survey programs include the Cook Inlet marine drift and set gillnet fisheries mammals observer program, and the Cook Inlet beluga population survey. . Offshore killer whale surveys in the Gulf of Alaska are conducted by the Southwest Fisheries Science Center as part of a coast-wide program. The National Marine Mammal Laboratory and the Office of Protected Resources are cooperators with the U.S. Geological Survey (DOI) and the NIST in conducting the National Marine Mammal Health and Stranding Response Program that will be discussed below under multiagency programs.

Oceanic and Atmospheric Research: OAR is a complex of oceanographic and macrofauna monitoring and evaluation activities that involves NMFS, and other NOAA personnel. The fisheries oceanography program (FOCI) in the Pacific Marine Environmental Laboratory (PMEL) in Seattle has an element in the Shelikof Strait, between Kodiak and the Alaska Peninsula. This and other Gulf of Alaska monitoring projects are conducted by the Resource Assessment and Community Ecology (RACE) division of NMFS (AFSC). PMEL also conducts retrospective fisheries and

oceanographic studies and is involved with Data Rescue. OAR's Climate Diagnostics Center holds the Comprehensive Ocean-Atmosphere Data Set (COADS) with surface marine data since 1854. OAR also houses Fisheries and Oceanography and Bering Sea Ecosystem Studies (CIFAR) and Sea Grant, SG. Some NOAA-sponsored US GLOBEC projects work through CIFAR on funding originating in NOS. Both CIFAR and SG support research projects at universities.

National Ocean Service: In cooperation with the National Science Foundation, NOS supports oceanographic research in the Gulf of Alaska, providing about half the support for the Northeast Pacific subprogram of the US GLOBEC. Substantial programs of the GLOBEC program are retrospective analyses and monitoring studies. NOS is responsible for the Kachemak Bay Ecological Characterization study. NOS also conducts the National Status and Trends Program which currently includes Gulf of Alaska samples in the Mussel Watch contaminants project and formerly included the Benthic Surveillance Project here. With National Institute of Standards and Technology (NIST), specimens are held in the Specimen Banking Project.

National Environmental Satellite, Data, and Information Service: NESDIS holds most of the historical information gathered by NOAA agencies, and current satellite oceanographic, buoy data, and sea ice information. Much of the information is stored at the National Oceanographic Data Center (NODC) and the National Climate Data Center (NCDC). NODC and NCDC cooperate with NASA, the National Weather Service (NWS), and many international agencies to provide global information such as sea surface temperature, wind speeds and vectors, biological productivity, salinity, absolute sea height, and other types of observations.

NODC is a major partner in a number of United Nations (UN) projects, one of which is the Global Ocean Observing System, GOOS. One element of that uses ships of opportunity to collect global weather and meteorological data (see Global Climate Change Research section IV.B.6 below).

National Weather Service: NWS has real-time weather and oceanographic data at the National Buoy Data Center, and it cooperates with NODC to provide historical monitoring data. NWS programs active in the Gulf of Alaska include the Moored Buoy Program and the Coastal Marine Automated Network (C-MAN).

National Institute of Standards and Technology: The NIST cooperates with USGS, NMFS, and OPR with the National Biomonitoring Specimen Bank.

3. Alaska Department of Fish and Game

The Division of Commercial Fisheries of ADF&G does substantial monitoring of salmon and other andromous fish species, herring, crabs, shrimp and several other invertebrate species, and some species of mammals. ADF&G is responsible for the Gulf of Alaska portion of the Coded Wire Tag database, which contributes to understanding ocean distributions of salmon. ADF&G point of sales (fish ticket) information supports understanding of abundance and distribution of salmon, crabs, herring, and other species. ADF&G has extensive historical information on the distribution of some species of crab and shrimp in the Gulf of Alaska from southeastern Alaska to the Aleutian Islands. ADF&G has archives of scales and size at age from salmon and herring that enable understanding of historical marine growth regimes.

An extensive archive of genetic data on chum, sockeye and other species of salmon is being assembled by ADF&G in cooperation with NMFS and agencies of nations participating in the North Pacific Anadromous Fish Commission. The data permit understanding of the oceanic distribution of salmon, and thereby contribute to understanding oceanic regime shifts. ADF&G also conducts genetic research on crabs, some rockfish, herring, and pollock.

ADF&G and cooperating regional aquaculture associations also collect some physical and biological oceanographic data, such as Kodiak near shore sea surface temperatures, Kitoi Bay (Kodiak) zooplankton biomass, and Prince William Sound zooplankton settled volumes. The ADF&G Subsistence Division's Whiskers database on subsistence harvest of marine mammals is part of a larger NOAA sponsored program. In addition, Wildlife Conservation Division monitors harbor seals in cooperation with NMFS. Note that most ADF&G marine programs serve to provide information to NOAA programs.

4. US Department of the Interior

Fish and Wildlife Service: The Alaska Maritime National Wildlife Refuge monitors 10 seabird colonies annually, 4 of which are in the Gulf of Alaska. The AMNWR also monitors other sites on a periodic basis largely dependent upon availability of funds.

Minerals Management Service: MMS provides substantial support for projects related to the potential effects of oil and gas exploration and recovery that are largely conducted by other agencies and contractors. Studies envelop a wide range of resources

such as sediment quality, seabird monitoring, mapping of rip tides, Cook Inlet forage fish and others. MMS has funded a varied range of project types for many years.

Geological Survey, Biological Resources Division: BRD maintains a seabird database and a pelagic seabird atlas. Success depends on many other projects from several agencies for data. In addition since the 1970's BRD has an extensive seabird monitoring project at Middleton Island, the MI Marine Biological Station. BRD also is in process of assembling the Pacific Seabird Monitoring Database. The Alaska Marine Mammals Tissue Archival Project (AMMTAP) and the Seabird Tissue Archival Monitoring Project (STAMP) are probably the most significant contaminants studies in Alaska. BRD participates as part of a large multiagency suite of projects discussed below. In addition to biological programs, USGS has extensive expertise in other areas of interest to GEM, such as long time series of measurements of freshwater runoff, and the capability to produce high-resolution maps of the sea floor (Gardner et al. 1998).

5. Transboundary Organizations

Transboundary organizations coordinate information gathering across national, provincial and state boundaries. As a result of transboundary conventions addressing fishery management, pollution control, and other matters of concern in the North Pacific, multinational and interstate management institutions have been in place for most of the twentieth century. These institutions have amassed some of the longest time series of biological observations in the North Pacific. The umbrella transboundary organization for the North Pacific, the North Pacific Marine Science Organization, PICES, was established in 1992 among Canada, People's Republic of China, Japan, Republic of Korea, Russian Federation, and the United States of America. PICES coordinates North Pacific (above 30° N) marine information and research in the northern North Pacific on topics such as the ocean environment, global weather and climate change, living resources and their ecosystems, and the impacts of human activities. In order to facilitate the exchange of information the PICES Technical Committee on Data Exchange has links to long time series on biological, physical, and chemical oceanography, fisheries, and meteorology and marine science organizations (http://pices.ios.bc.ca/data). The long time series data set is a compilation of voluntary submissions from data sources, and it is therefore not exhaustive.

The International Pacific Halibut Commission, IPHC was the first multinational fishery management organization in the North Pacific. The United States and Canada established it in 1923. The IPHC annual survey provides a long time series of standardized catch of Pacific halibut and associated species. The IPHC time series of research vessel surveys starts in 1925, and it is is a particularly valuable record of organisms associated with the benthos because of the scrutiny it has received as the basis for many peer reviewed publications over the years.

The International Pacific Salmon Fishing Commission, IPSFC (1937 – 1985) was established by the United States and Canada in 1937 to restore the sockeye salmon of Canada's Fraser River and to allocate the catches between nations. The IPSFC and its successor, the Pacific Salmon Commission, PSC (1985), have compiled a very long time series of annual Fraser River salmon production, augmented by substantial time series of estimated sockeye salmon productivity by year of spawning. The PSC also has time series of annual harvest and exploitation rates for selected chinook salmon populations, as well as catch and other time series data for all salmon species.

The International North Pacific Fisheries Commission, INPFC (1952 – 1993, U.S., Canada, Japan) and its successor, the North Pacific Anadromous Fish Commission, NPAFC (1993, U.S. Canada, Japan and Russia and cooperating nations) coordinate research and harvest of salmon and other andromous species above latitude 33° N outside the 200-mile zones of the signatories. INPFC published long time series of catches for principal groundfish species, crab, shrimp and herring for the signatories, and for cooperating nations, Poland, South Korea, and Taiwan. The INPFC statistical yearbooks (1952 – 1992) contain biological time series on groundfish, crabs, and marine mammals. The NPAFC Statistical Yearbooks (1993 – 1995) are the definitive source for catch, weight and hatchery releases for salmon in the North Pacific, as well as principal groundfish species, crab, shrimp, and herring.

Arctic Monitoring and Assessment Programme (AMAP), is an international circumpolar program which seeks to monitor anthropogenic pollutants in all parts of the Arctic environment (http://www.grida.no/amap/assess/soaer1.htm#amap). Observations extend into the Bering Sea, but not into the Gulf of Alaska as yet. The nations of Canada, Denmark/Greenland, Iceland, Norway, Sweden, the Soviet Union, and the United States entered into the 'Rovaniemi process' that promotes arctic environmental protection in 1989 at as meeting in Rovaniemi, Finland. The 'Rovaniemi process' produced a series of 'State of the Arctic Environment' reports on potential pollutants in different parts of the Arctic environment and its ecosystems in 1991. The First Arctic Ministerial Conference in Rovaniemi, Finland (June 1991) established international cooperation for the protection of the Arctic, and led to the adoption of the Arctic Environmental Protection Strategy (AEPS). The AMAP reports contain time series data on contaminants in the areas of interest. The policy body for AMAP is the Arctic Council.

The Pacific States Marine Fisheries Commission, PSMFC is an interstate organization created by the U.S. Congress in 1947 to coordinate fisheries issues among California, Oregon, Washington, Idaho, and Alaska. The PSMFC Regional Mark Processing Center (http://www.psmfc.org/rmpc/) is the keeper of the salmon coded wire tag data base, an authoritative source for time series observations on distribution of ocean catches from California to Alaska, including Canada since 1972.

6. Global Climate Change Research

The United States is participating as part of a world-wide network dedicated to measuring and understanding global climate change. Global change research programs are valued in the billions of dollars, with state, national and international partners and cooperators. Four international oceanographic investigations on global climate change have elements relevant to the North Pacific, Global Climate Change (GLOBEC), World Ocean Circulation Experiment (WOCE), Joint Global Ocean Flux (JGFOS), and Global Ocean Observing System (GOOS) each rely on the personnel, facilities and finances of the nations and organizations that participate in the transboundary organizations described above in the section on transboundary organizations.

GLOBEC is the global change program of the International Geosphere-Biosphere Programme (IGBP) of the International Council for Science. The IGBP provides an international, inter-disciplinary framework for the conduct of global change science. GLOBEC is an oceanography program that is examining a number of hypotheses that include a commercially harvested fish species, pink salmon. A key GLOBEC hypothesis is that rapid growth and high survival of pink salmon depends on cross-shelf import of large zooplankton from offshore to nearshore waters (see also section IV. D.2.b). GLOBEC is also collecting data on zooplankton species, including a copepod and several krill species. Physical processes to be examined include stratification, cross-shelf-transport, downwelling and mesoscale circulation in the Gulf of Alaska. Another part of IGBP is the Joint Global Ocean Flux (JGFOS), which is studying the role of the ocean in controlling climate change through the storage and transport of heat.

The GOOS, organized by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, is to be a permanent global system for collecting data, modeling and analyzing marine and ocean processes worldwide. Another IOC sponsored program is World Ocean Circulation Experiment, WOCE, under the auspices of the World Metorological Association. WOCE sponsors a large number of investigations directed at understanding the currents of the world's oceans, including the Pacific and North Pacific. Made with many different types of instruments and platforms, most of the measurements of the WOCE measurements took place earlier this decade. The information is now being used in research programs to create models of circulation and associated physical factors such as temperature.

C. An overview of valued GOA resources and recent changes

1. Fish and Shellfish

The fish and shellfish fisheries of the Gulf of Alaska have been among the world's richest in the second half of the twentieth century. Major fisheries include, or have included, numerous species of shrimp and crab, five species of Pacific salmon,

Pacific cod, Pacific halibut, sablefish, herring, rockfish, pollock, flatfishes, scallops and other invertebrates. Among the most important of the GOA groundfish species, exploitable pollock populations in 1999 were estimated at 738,000 metric tons (mt), down from a peak of about 3 million mt in 1982 (Witherell 1999). Annual numbers of two-year old pollock entering the fishable population (recruitment) from 1981 to 1987 were erratic and usually lower than recruitments estimated in 1977 – 1980. Pacific cod of the GOA are also an economically and ecologically important species. Pacific cod had an estimated fishable population of 648,000 mt in 1999, which is on the low end of the range of 600,000 – 950,000 mt estimated 1978 – 1999. Annual recruitments of GOA Pacific cod have been relatively stable since 1978, with exceptionally large numbers of three-year old recruits appearing in 1980 and 1998 that were in 1977 and 1995. Biomass of the dominant flat fish in the GOA, the arrowtooth flounder is approaching 2 million mt. Arrowtooth flounder is not heavily harvested, and their biomass has been steadily increasing since 1977. By comparison, the exploitable biomass of another flatfish, the highly prized Pacific halibut in 1999 is estimated at 258,000 mt, which is above average for 1974 - 1999 (Witherell 1999). Exploitable biomass of Pacific halibut was also increasing 1974 – 1988, after which it declined slightly. As possibly explained by a combination of climate change and fishing patterns, the status of crab populations, as covered below, are quite poor compared to the relatively strong groundfish populations.

Strength of both salmon and groundfish populations in the northeast Pacific appear to vary in concert with features of climate, but the responses appear to be different (Francis et al. 1998). Groundfish recruitments follow a cycle with a roughly ten year period that is closely related to the El Nino Southern Oscillation (ENSO) (Hollowed and Wooster 1992), whereas salmon abundance changes sharply at intervals of 20 –25 years in concert with the Pacific Decadal Oscillation (PDO) (Hare 1996). The ENSO and the PDO were shown to be independent of one another (Mantua et al. 1997).

The opposite responses of groundfish/salmon (positive) and crab (negative) recruitment to intensified Aleutian Lows may be because different species-specific mechanisms are invoked by the same weather pattern. Since the groundfish species of Hollowed and Wooster (1992; 1995) were mostly winter spawners, Zheng and Kruse (In press) hypothesize that strengthened Aleutian Lows increase advection of eggs and larvae of groundfish toward onshore nursery areas, improving survival. Salmon, on the other hand, benefit from increased production of prey items under intense lows.

Since the climatic regime shift in 1978, pollock and other cod-like fish have dramatically increased and maintained high population levels, replacing shrimp in nearshore waters as the dominant group of organisms caught in mid-water trawls on the shelf (Piatt and Anderson, 1996). Pacific halibut appear to undergo decadal-scale changes in recruitment, which have been correlated with both the 18.6-y lunar nodal tide cycle (Parker et al., 1995) and the PDO. There also is a reported coincidence of size-at-age data for Pacific herring with this same cycle (Ware, 1991). The patterns are not as

clear with herring, but the populations tend to be dominated by the occasional strong year class and show considerable variability in landings over the years.

In a recently completed study of time series of recruitment for 15 crab stocks in the Bering Sea, Aleutian Islands and Gulf of Alaska, time trends in 7 of 15 crab stocks are significantly correlated with time series of the strength of Aleutian Low climate regimes (Zheng and Kruse, in press). Time trends in recruitments among some king crab stocks were correlated over broad geographic regions, suggesting a significant role of environmental forcing in regulation of population numbers for these species. The increased ocean productivity associated with the intense Aleutian Low and warmer temperatures was inversely related to recruitment for 7 of the 15 carb stocks. The seven significantly negative correlations between ocean productivity and crab recruitment were from Bristol Bay, Cook Inlet and the Gulf of Alaska. Crab stocks declined as the Aleutian Low intensified. A significant inverse relation between red king crab brood strength and Aleutian Low intensity was reported earlier for one of the stocks in this study, red king crab from Bristol Bay (Tyler and Kruse 1996).

Tyler and Kruse (1996; 1997) and Zheng and Kruse (In press) have articulated an explicit series of hypotheses linking features of physical and geological oceanography to the reproductive and developmental biology of red king and tanner crab to explain observed relations between climate and recruitment. Tanner and red king crab in the Bering Sea are thought to respond differently to the physical factors associated with the Aleutian Low due to the distribution of the different sea bottom types required by the post-planktonic stage of each species. Suitable bottom habitat for red king crabs in Bering Sea is more generally nearshore, whereas suitable bottom habitat for Tanner crab is offshore. Intense Aleutian Low conditions favor surface currents that carry or hold planktonic crab larvae onshore, whereas weak Aleutian Low favors surface currents that move larvae offshore. The process may not be species specific, but stock specific, depending on the location of suitable settling habitat in relation to the prevailing currents. In the case of red king crab, Zheng and Kruse (In press) explain the apparent paradox of lowered recruitment for red king crab during periods of increased primary productivity. Red king crab eat diatoms, but show a preference for diatoms similar to *Thalassiosira* spp. which dominates in years of weak lows and stable water columns. Strong lows mean well mixed water columns and a diverse assemblage of primary producers, which may be unfavorable for red king crab larvae, but favorable for Tanner crab larvae. Tanner crab larvae eat copepods which are favored by the higher temperatures associated with intense lows.

No commercial fisheries are allowed for such "forage" fishes as eulachon, sand lance, capelin, and lantern fish. In the absence of commercial catch data, the fluctuations of their populations are not well-known. Some information on changes of forage fish comes from sampling the diets of colony nesting seabirds and the stomach contents of Pacific halibut, as well as from many years of mid-water trawls around Kodiak Island and

on the Alaska Peninsula (Piatt and Anderson, 1996). Data from the latter study indicated, for instance, that capelin nearly disappeared from the northern GOA shelf in the early 1980s. The evidence that climate (i.e., the PDO index) is very significantly correlated with fisheries for Pacific salmon in the GOA is very strong (Hare et al., 1999), with dramatic increases after the strong shift to a positive PDO index in the late 1970s. In addition analysis of the eastern GOA data on fishes, showed that many flatfish stocks increased following the 1977 PDO shift, but several dominant groundfish stocks did not (i.e., Atka mackrel, Pacific cod, Pacific hake and walleye pollock) (Franciset al, 1998) With fisheries accounting for up to 25% of the energy produced by coastal shelf and upwelling systems on a worldwide basis (Pauly and Christensen, 1995), the sustainability of gulf fisheries must be put in the context of climate change.

2. Seabirds

The GOA supports large aggregations of colony nesting seabirds: 26 species contribute to an estimated total of 8 million birds in 1987 in the GOA (DeGange and Sanger, 1987). In addition, the large estuarine habitats in Cook Inlet and the Copper River Delta are critically important for migrating shorebirds (Senner, 1999) in the spring. During the summer breeding season, colonial seabirds aggregate at about 800 different colonies around the periphery of the GOA (DeGange and Sanger, 1987) to feed on the plankton, nekton, and mainly the forage fishes living in the coastal and shelf environment. It is well known that the general fertility of various marine systems is reflected in the abundance and productivity of sea birds that nest and reproduce nearby (e.g., Furness et al. 1997; Phillips et al., 1996).

Seabirds also provide a relatively easily accessible source of tissues (e.g., eggs and feathers), that integrate changes in the availability of some contaminants and abundances of stable isotopes of carbon and nitrogen in the food web. Gulf seabirds consume more than one million metric tons of marine organisms each breeding season. Since different seabird species feed in different ways (e.g., black-legged kittiwakes feed at the surface and common murres dive deeply), their distributions and productivity can give indications of the distribution and availability of their prey.

While the very favorable production regime for salmon in the central gulf was occurring, many, but not all, nearshore seabird colonies were in decline (e.g., Piatt and Anderson, 1996; Hatch et al., 1993)(Fig. X-1). This was apparent in PWS, especially in data on black-legged kittiwakes from southern PWS (Irons, 1996). One compelling contrast from adjacent Cook Inlet was the decline over the last 20 years in seabirds at Chisik Island, while seabirds at Gull Island in Kachemak Bay were increasing during this period (Piatt, unpublished)

3. Marine Mammals

Three groups of marine mammals occur in the northern Gulf of Alaska, cetaceans (whales and dolphins), pinnipeds (seals, sea lions and walrus), and the sea otter. One species, the Steller sea cow, was extirpated about 1768 (Hood and Zimmerman 1986). The sea cow was an important component in nearshore kelp communities, the largest recent herbivore to have grazed on macroalgae. Most species of marine mammal experienced some level of commercial harvest starting in 1741 when Vitus Bering explored the Bering sea northern GOA area and laid claim to it for Russia. Harvest of marine mammals has been radically reduced in these waters during the twentieth century. Although some low levels of harvest for subsistence purposes still occurs, some species have responded to the cessation of harvest by increasing their numbers. For example, some species of pinniped such as the northern elephant seals have increased dramatically during recent decades. But even with cessation of most harvest, some species such as fur seals, Steller sea lions, and harbor seals have undergone dramatic declines coincident with changes in oceanography, forage fish and seabird populations in the GOA over the past twenty years.

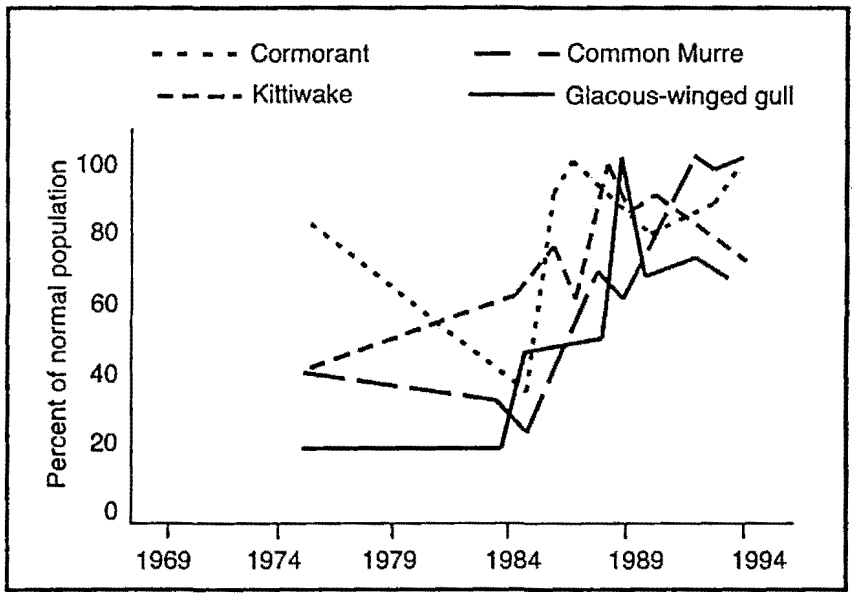
Sea otters, very nearly extirpated from the North Pacific by 1900, have also benefited from the near cessation of human harvest. Since that time the species has increased dramatically throughout most of Alaska, and has itself precipitated profound changes in the structure and function of coastal marine communities of less than 100m depth. During the past decade large declines in sea otter abundance has been noted in the central Aleutian Islands, although the exact extent of the decline is unknown. One hypothesis advanced to explain the decline involves killer whales using otters as a replacement for the now rare pinnipeds (seals and sea lions).

Restoration of whale populations could have dramatic effects on the ecosystem. Most mysticeti whales (e.g. fin, minke, and humpback) forage on zooplankton and small schooling fish, and consume large quantities of secondary production. Generally, great whale populations remain depressed and far below historic numbers from the effects of commercial exploitation. The effects of reduced whale abundance on zooplankton and forage fish populations are largely unexplored for the North Pacific. Recovery of depleted whale populations may be predicted during the next century.

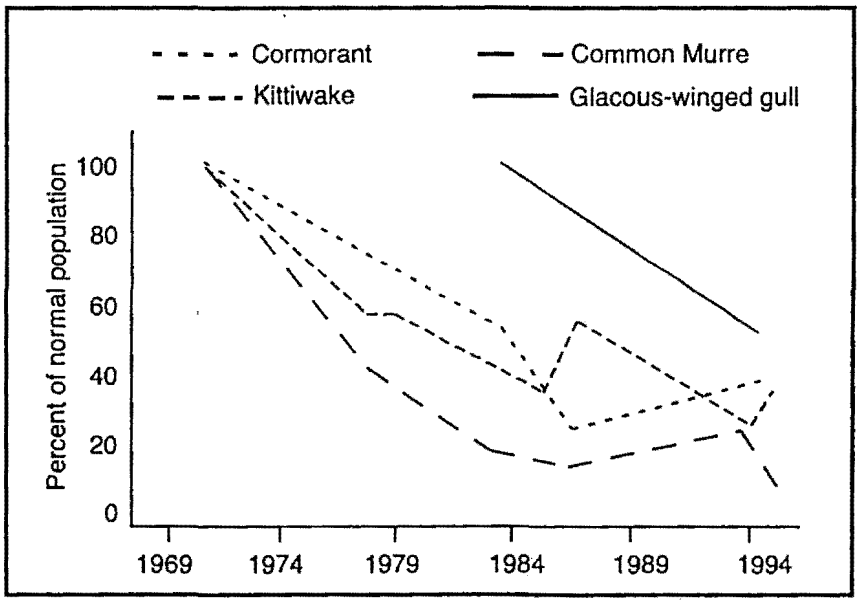
Northern fur seals have been in steep decline in the Bering Sea and their decline may be related to conditions in the GOA (Trites 1992).Although food limitations in the Bering Sea may not be limiting population growth, food limitations in the Aleutians and in the Gulf of Alaska may be creating a population growth bottleneck by causing high mortalities on juveniles during migrations. The bottleneck hypothesis of fur seal abundance control (Trites 1992) illustrates but one of many ecological connections between the Bering Sea and the Gulf of Alaska. Steep declines in harbor seals in the

Gulf of Alaska have been documented in and around Kodiak Island 1956 – 1976 (Pitcher 1990) and in Prince William Sound throughout the 1990's (Figure X-2, Piatt 1998).

Concepts on control of marine mammal populations focus on food limitation and hunting or other human removals. Steller sea lions, now listed under the Endangered Species Act, have declined steeply starting in the early 1970's, particularly in the Aleutian Islands (Trites 1992). Current hypotheses on limitation of Steller sea lion abundance center on food limitation, possibly due to competition with humans for prey species (Bowen et al. 1999). Current information is not conclusive with respect to the role of fisheries in causing food limitation for Steller sea lions (Bowen et al. 1999). The possibility remains that climate change and its effect on species composition of prey species plays an important role in regulating marine mammal populaitons.



Gull Island, Outer Cook Inlet



Chisik Island, Cook Inlet

Figure X-1. Long-term decline of seabirds at Chisik Island, Cook Inlet (bottom) and increase at Gull Island, Outer Cook Inlet (top). (Piatt and Anderson, 1996).

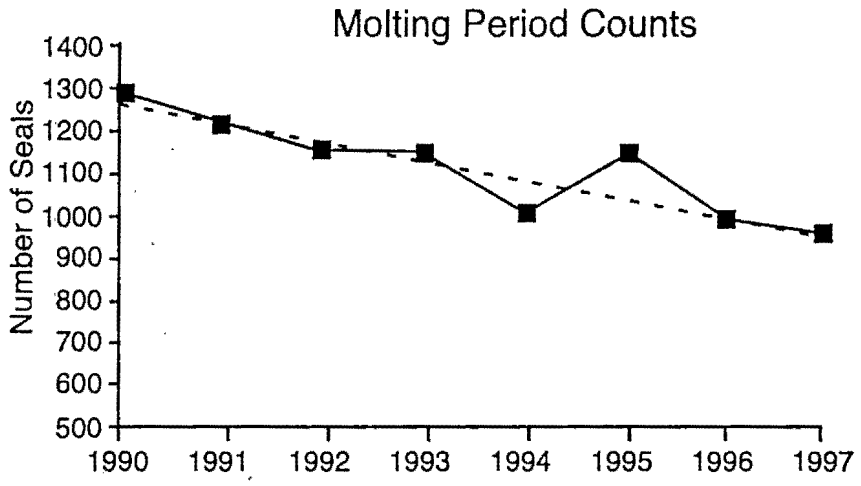


Figure X-2. Population trend of molting seals in Prince William Sound. (Piatt, 1998)

D. Ecological Setting

The primary purpose of the GEM program is to provide a better understanding of how valued marine populations such as fish, shellfish, seabirds and marine mammals are produced. In order to understand how these populations change, what causes them to change, and to provide the means to help predict these changes, we must understand their environment. So, in this section the northern Gulf of Alaska ecosystem is described, beginning with the geological features that define the oceanic and coastal regimes. Next, ocean circulation and how it affects nutrient recycling is described. And, finally, the physical and chemical processes that set the bounds for productivity and control the transport of produced organic matter are discussed. This sets the stage for the conceptual model that is described in the following section.

1. The Gulf of Alaska Ecosystem

The area affected by the *Exxon Valdez* oil spill encompasses a number of different environments within the northern Gulf of Alaska (GOA) marine ecosystem (Fig. X-3). Within these offshore marine, nearshore marine, estuarine, freshwater and terrestrial environments, geological, climatic, oceanographic, and biological processes interact to produce the highly valued natural beauty and bounty. The GOA is: a major source of seafood for the entire nation, as well as for Alaska Natives who rely on it for subsistence and cultural purposes; a part of the "lungs" of the planet for recycling of oxygen and carbon to and from the atmosphere; habitat for diverse populations of fish and wildlife; and a source of beauty and inspiration to those who love natural things.

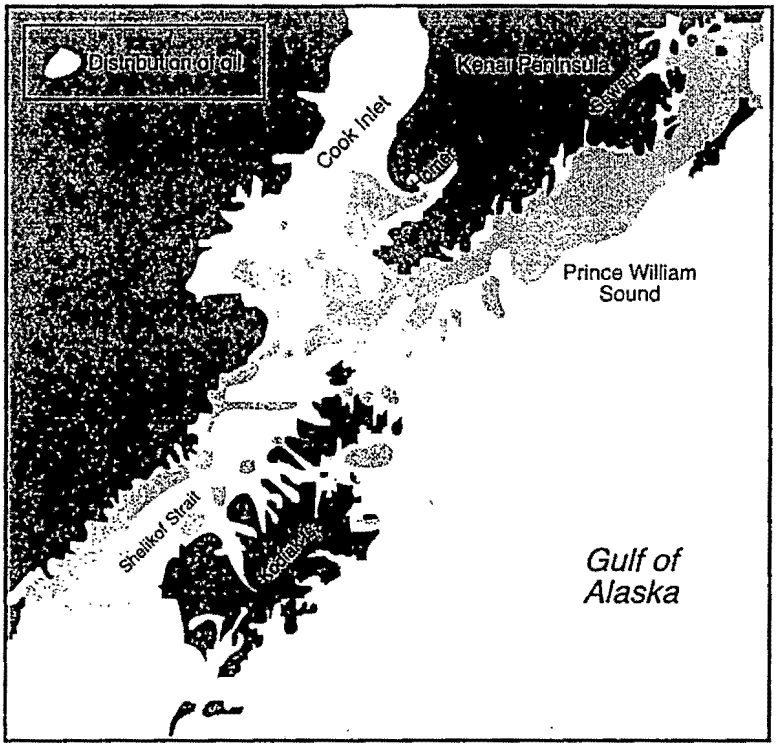


Figure X-3. Map of the *Exxon Valdez* oil spill area.

a. Seabed Topography

The northern GOA contains a large subarctic ocean basin. Its extensive and spectacular shoreline has been and is being shaped by plate tectonics and massive glacial activity (Hampton et al, 1987). The shoreline is bordered by a continental shelf ranging to 200 meters in depth (Fig. X-4). In the eastern GOA, the shelf is variable in width from Cape Spencer to Middleton Island. It broadens considerably in the north between Middleton Island and the Shumagin Islands and narrows again through the Aleutian Islands. The continental slope, down to 2000 meters, is very broad in the eastern GOA, but it narrows steadily southwestward of Kodiak, becoming only a narrow shoulder above the wall of the deep Aleutian Trench just west of Unimak Pass (Figure IV-4). The continental shelf is incised by extensive valleys or canyons (Carlson et al., 1982) that may be important in cross-shelf water movement, and by very large areas of drowned glacial moraines and slumped sediments (Molnia, 1981).

b. Climatic Oscillations

The GOA has a variable and severe climate and is the incubator for the winter storms that sweep across the North America continent via the Aleutian storm track (Wilson and Overland, 1987). Three semi-permanent atmospheric pressure regions dominate climate in the northern GOA—the Siberian and East Pacific high-pressure systems and the Aleutian low-pressure system (Fig. X-5a, b). These have variable, but characteristic, seasonal locations. The Aleutian low pressure system averages about 1002 millibars (Favorite et al. 1976), is most intense in winter, and appears to cycle in its average position and intensity with about a 20-25 year period (Rogers, 1981; Trenbreth and Hurrel, 1994). The North Pacific Oscillation (NPO), as this cycle is called, appears to be a major source of oceanographic and biological variability.

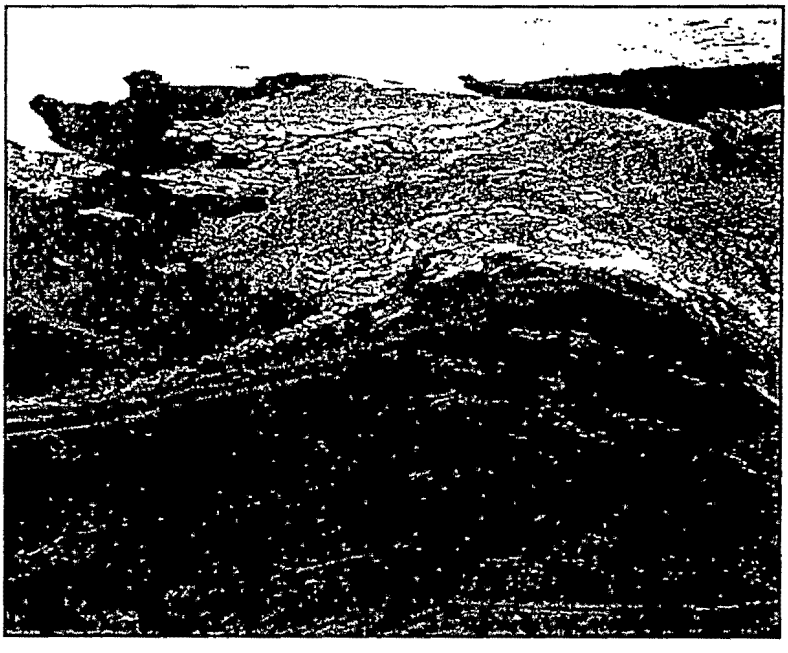


Figure X-4. Satellite radar image of the northern Gulf of Alaska. Continental shelf, seamounts, and abyssal plain can be seen in relief. (Composite image from SEAWIFS Remote Sensing satellite, NOAA).

Low-pressure systems or storms frequently arise from the GOA. Although the storm track is well-known, the severe winter weather that comes from the northern GOA is particularly unpredictable on a short-term basis due to the interplay among the relatively warm air masses over the gulf, the cold continental air masses inland, and the dominating coastal mountains (Alaska, Chugach and Wrangell-St. Elias ranges) in between. These features support blocking high-pressure ridges, which deflect storm

tracks to the north and south for periods as long as several weeks, but which have an average persistence of 7-10 days (Treidl et al., 1981). This interplay between eastward moving storm systems and blocking high pressure in winter is quite variable from year to year, but undergoes long-term cycles on or about the same period as the NPO (e.g., see White and Clark, 1975)

Mantua et al. (1997) have calculated the Pacific Decadal Oscillation (PDO) index, which tracks the NPO. The PDO index had strong positive values from 1900 to about 1912, during most of the 1930s and early 1940s, and then again during the late 1970s, 1980s and most of the 1990s. From about 1948 through 1976 the PDO was negative and then again for 3 years in the early 1990s (Hare et al., 1999). Fig. X-5 shows winter-time examples from two climatic regimes: a negative PDO regime example from 1972 and a positive PDO example from 1977. In addition, there is evidence that the Aleutian storm track has shifted to a more southerly position during this century (Richardson, 1936; Klein, 1957; Reitan, 1974; Whitaker and Horn, 1982; and Wilson and Overland, 1987). There also is a low-frequency lunar nodal cycle of 18.6 years, possibly working through an enhancement of poleward geostrophic flow (due to differences in seawater density) or increased tidal mixing in its positive phase, as an attractive alternative or complementary hypothesis for external forcing factors (Parker et al., 1995).

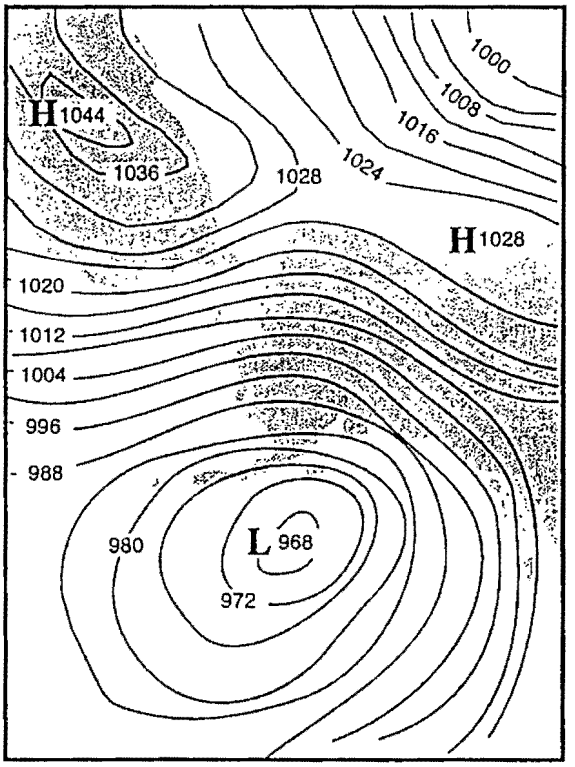


Figure X-5a. Typical winter example of the Alutian low and Siberian high pressure systems. Contours refer to sea-level pressure in millibars. (From Carter, XXXX).

c. Ocean Circulation and Currents

Net surface-water circulation is counterclockwise, or cyclonic, in the GOA (McEwen et al., 1930; Sverdrup et al., 1942) and consists of two major ocean-current systems (Fig. X-6). The nearshore Alaska Coastal Current is a buoyant, eastern boundary current, differentiated from the underlying and offshore water masses by virtue of its lower salinity. The variability in its flow is due to differences in seawater density, less so to winds, and is dominated by large seasonal salinity changes, with greatest freshwater discharge and strongest flow (at least in the central and western GOA) in the fall (Royer 1979, 1981, 1982). Seasonal changes in temperature are less important in influencing flow. Winds from the west, south and southwest, depending on the location in the gulf, tend to push this current shoreward and constrain it to a relatively narrow band (Royer, 1983). The Alaska Coastal Current frequently enters PWS (Niebauer, 1994; Vaughan, unpublished data), dominates the circulation of lower Cook Inlet, and is responsible for one-way net flow to the southwest through the Shelikof Strait (Reed and Schumacher, 1987). During relatively warm climatic periods with above average precipitation (positive PDO), the Alaska Coastal Current is strengthened (Royer, 1983). Major eddies also have been described in the Alaska Coastal Current (e.g., Schumacher et al., 1993) and these may well have significant biological implications (Schumacher and Stabeno, 1993).

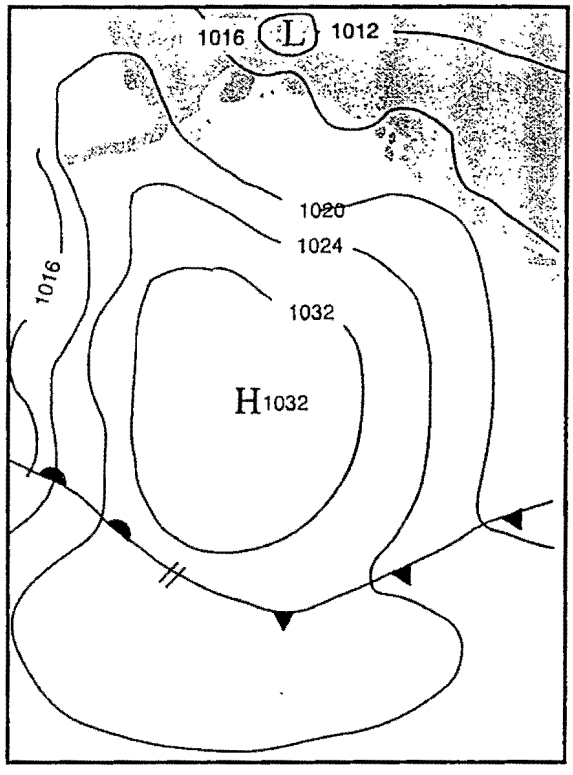
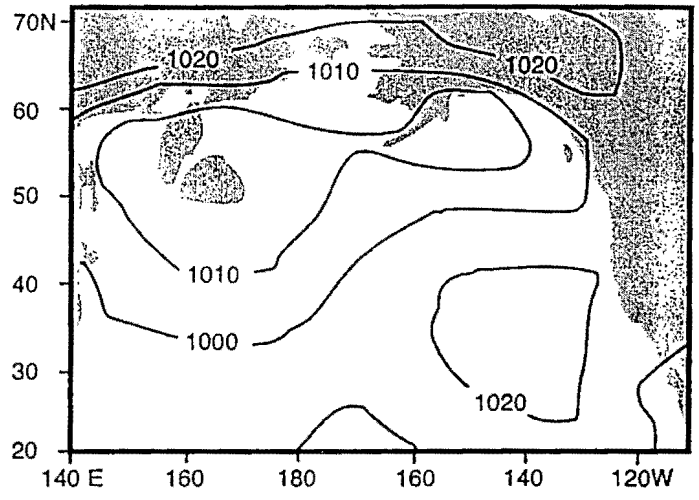
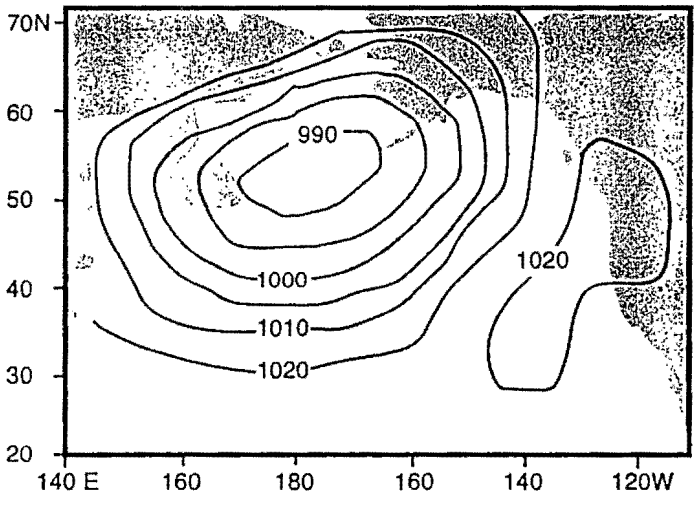


Figure X5b. Typical summer example of the Alutian low and east Pacific high-pressure systems. Contours refer to sea-level pressure in millibars. (From Carter, XXXX).

Farther offshore, the Alaska Current forms the poleward-flowing eastern portion of the North Pacific subarctic gyre and generally follows the upper slope and shelf break. It is broad in the east and narrows and strengthens southwest of Kodiak Island into the Alaska Stream, the westward flowing portion of the subarctic gyre (Reed and Schumacher, 1987). This dominant current system often may have computed velocities in excess of 80 to 100 centimeters/second and net transport in excess of 6 $x10^6$ m^3/s. This is particularly so near the outer Alaskan Peninsula and Aleutian Islands, where sharp salinity decreases inshore generate steep geostrophic potentials and fast flows (Reed and Schumacher, 1987).



1972



1977

Figure X-5. Mean sea-level pressure patterns from the winters of 1972 and 1977. (From Emery and Hamilton, 1985).

With regard to the interannual variability of current flows, it is generally thought that more intense cyclonic activity in the atmosphere will result in stronger flows in the Alaska Gyre and more of the westwind drift will go to the south to California Current system (e.g., Hollowed and Wooster, 1992). The proposed decadal scale variation in currents of the northeastern Pacific are shown in Figure X-7. Weak flows of the Alaska Current in the eastern gulf have been associated with years of higher-than-normal salinity (Ingraham et al., 1991). Reed and Schumacher (1987) describe a summer 1981 collapse of wind stress in the eastern gulf, which was accompanied by the widespread distribution of warm and relatively fresh surface water. At the same time, wind stress increased in the western gulf, diverting water flowing in to the southern gulf more to the northwest. They suggested that such changes, although not frequently characterized nor well understood, may affect biological processes throughout the region. For example, one would expect the persistence of such conditions to favor water-column stratification, and subsequent depletion of surface water nutrients during the later portion of the summer growing season.

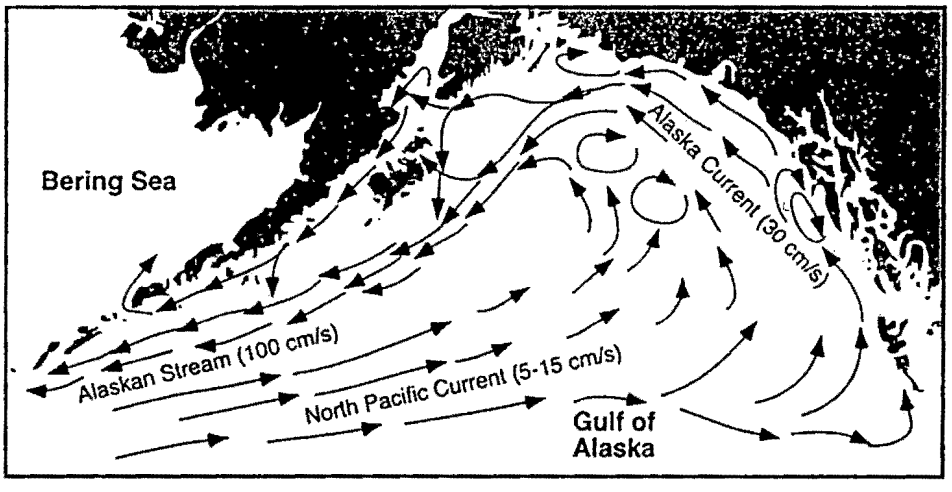


Figure X-6. Currents in the Gulf of Alaska. (McEwen et al., 1930).

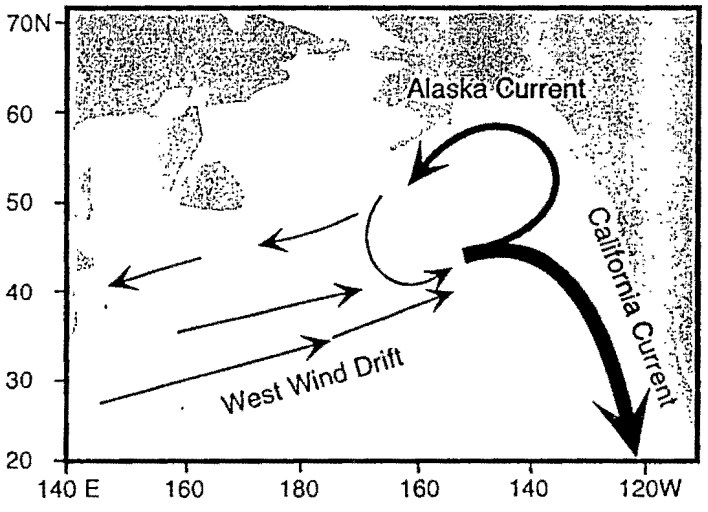
During periods when the NPO favors a more intense, northerly position of the winter Aleutian Low Pressure system, winds in the eastern GOA are stronger (Emery and Hamilton, 1985; Mantua et al., 1997), there is more precipitation and Ekman transport is

greater. Polovina et al. (1994, 1995) showed that after the 1977-1978 spring-summer, the mixed-layer depth in the north Pacific was 10-30% shallower than normal and that this change, with associated changes in temperature, could have resulted in 50% higher rates of primary and secondary production.

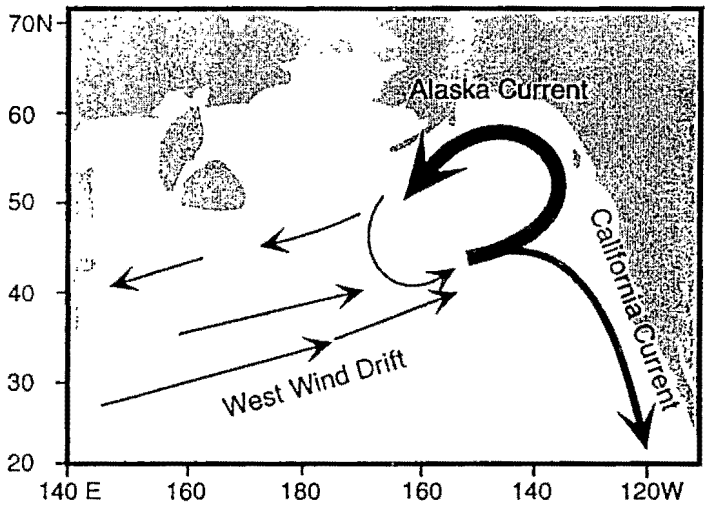
d. Nutrients and Fertility

The fertility of GOA waters depends on nutrient recycling from depth to the surface layer where plants grow. The deep waters of the central GOA have some of the highest concentrations of nutrients and the oldest carbon in the world's oceans (Mantyla and Reid, 1983), consistent with lack of deep-water formation in the north Pacific Ocean, slow turnover and trapping of significant amounts of nutrients at depth. Intense low-pressure systems and cyclonic circulation in the GOA favor nutrient transport to the surface in the central GOA (supporting evidence in the central gulf includes mounding of the oxygen minimum layer [Reid ,1965]; ^{14}C depletion in surface waters [Reeburg and Kipphut, 1987]; and presence of low-temperature, high-nutrient water [Sambratto and Lorenzen, 1987]).

One feature of the Alaska Gyre, also shared with the eastern Tropical Pacific and parts of the Southern Ocean is that nutrients (nitrates, phosphates and silicates) necessary to support phytoplankton growth are never apparently limiting (Heinrich, 1957; Beklemishev, 1957).



Winter 1972



Winter 1977

Figure X-7. Oceanic circulation patterns in the far eastern Pacific proposed for negative PDO (top) and positive PDO (bottom). (Hollowed and Wooster, 1992).

Onshore movement of more dense offshore water by winds results in coastal downwelling most of the year. Relaxation of these winds during the summer results in slightly favorable conditions for upwelling of deep nutrient-rich water onto the shelf, the supply of which undoubtedly varies from year to year. For example, in Resurrection Bay transport of offshore water into the Bay occurs mainly during periods of positive upwelling (Heggie and Burrell, 1981). In this predominantly downwelling shelf and coastal regime, the extent to which deep-water nutrients reach the more biologically productive nearshore surface waters and the mechanisms that transport it there during most of the year are only sketchily understood. Cross-shelf transport is not as well understood as oceanic water exchange with coastal water bodies. Bottom water in coastal fjords appears to be renewed by water originating from shallower than 250 m in the central gulf (Muench and Heggie, 1978). Renewal of bottom water in shallow-sill coastal fjords, like Aialik Bay on the outer Kenai Peninsula coast, occurs in spring. From near uniform density throughout the water column in winter, developing density gradients in the fjords in the spring allow denser (from winter cooling and reduced freshwater runoff) shelf water that enters as distinct masses on April tides to sink to the bottom of these fjords. Deeper fjords, such as PWS, are renewed in late summer and early fall as relatively warm and saline water originating in the central gulf below 150 m moves onto the shelf under conditions of reduced downwelling and onshore convergence of surface water.

e. Plankton and Productivity

Some of the basic conditions for phytoplankton growth in the central GOA, based on Ocean Station P, are outlined by Sambratto and Lorenzen (1987). The annual cycle starts in spring when the compensation depth for primary production increases to below 150 m with increasing insolation time and solar incident angle. At the same time, the mean mixed-layer depth, constrained from below by a permanent halocline at 150 to 100 m, rises rapidly between April and May from below 100 m to about 50 m. These changes result in a rapid increase in phytoplankton production in surface waters to between 200 and 800 mg C m^{-2} d^{-1}, through the summer, but the actual data to support this estimate of production are limited (e.g., Miller et al., 1991). The reported average annual rate of 170 g $Cm^{-2}y^{-1}$ is one of the highest in the world oceans (Welshmeyer et al., 1993). The most recent nutrient data suggest that nitrate and other nutrients are not limiting in the photic zone (i.e., that area reached by sunlight) during the growing season (Dugdale, 1967; Hattori and Wada, 1972; Miller et al., 1991). Iron has been suggested as limiting factor, but it appears that iron may set the characterisitics of the phytoplankton community, but not be limiting *per se* to the dominant small phytoplanton cells that attain a high level of productivity (Miller et al, 1991) A great deal of uncertainty about primary production is due both to a sparsity of direct measurements and to the fact that chlorophyll-a does not increase much during the annual production cycle (Anderson et al., 1977)—intense grazing during growth and sinking of cells are possible contributing causes (e.g., Booth et al., 1993). Recently, Miller et al. (1991) suggested that consideration of the grazing protozoans as an intermediate between phytoplankton and large (*Neocalanus*) copepods could well explain the lack of phytoplankton blooms in the presence of relatively low numbers of large copepods. A further iteration of a model that explains productivity in the surface waters of the Alaska Gyre is presented by Miller (1993). Essentially, high productivity is maintained by a shallow mixed layer that persists throughout the year, thereby preventing loss of key organisms out of the photic zone, including the abundant protozoans, which have high enough rates of cellular division to keep up with the phytoplankton populations. Apparently, ammonia recycled quickly from the micro- and macrozooplanknton to the phytoplankton (mainly flagellates), explains the continuous high concentrations of dissolved nitrate. With regard to long-term changes in phytoplankton, integrated measurements of chlorophyll-a over the central north Pacific indicate a general increase after 1977 (Venrick et al. 1987).

Annual primary production rates rise from central gulf values of 100 g C m^{-2} to values greater than 250 on the shelf and values between 150 and 200 g C m^{-2} in bays, sounds and inlets (Sambratto and Lorenzen, 1987). Unlike the oceanic regime offshore, nutrient depletion does occur inshore during the growing season (Larrance and Chester, 1979; Chester and Larrance, 1981), but otherwise the broad features of a physically mediated high-latitude bloom are in place inshore as well.

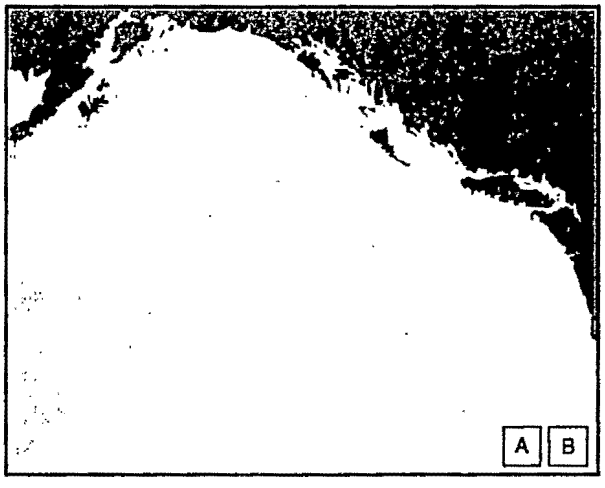
Results of the EVOS-sponsored Sound Ecosystem Assessment project (SEA) project include a model of the water column in Prince William Sound that has successfully produced the duration and extent of both phytoplankton and zooplankton blooms for several years (Eslinger, 1999). Atmosphere-sea-surface interactions in the early spring appear to set the conditions for the remainder of the spring-summer production period. Two general outcomes are seen for production: 1. Warm, quiescent springs have intense but brief phytoplankton blooms and relatively low zooplankton biomass, and 2. Colder stormy springs lead to longer phytoplankton blooms and higher zooplankton biomass.

It is generally thought that the more energetic physical environment on the shelf is responsible for sustaining these high rates of primary production, but coastal convergence and the predominately downwelling nature of the hydrography limit opportunities for water renewal from the deep GOA. Offshore fronts associated with the Alaska Coastal Current have been proposed as possibly active in producing enhanced plankton biomass seen at the shelf break. It appears that relaxation of coastal winds, local topography (e.g., at the entrance to Cook Inlet) interacting with strong tidal currents, and wind events are important factors in within-season nutrient resupply to the photic zone in a system where high freshwater input and long days can produce extended periods of stratification. The interplay of these factors throughout the growing season is undoubtedly critical to survival of the many juvenile forms of inshore life dependent on phytoplankton production.

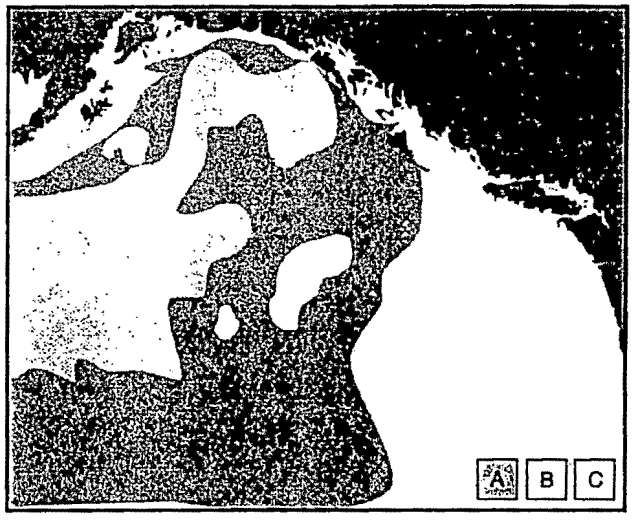
Zooplankton productivity in the GOA largely reflect patterns seen or inferred from phytoplankton productivity (Cooney, 1987). Thus, productivity of oceanic zooplankton populations may be as high as 30 g C m^{-2} yr^{-1} and up to 50 g C m^{-2} yr^{-1} on the shelf and in inside waters. This production occurs to a large extent in the spring bloom and follows an annual surge in phytoplankton production in the early spring. One of the unique characteristics of north Pacific zooplankton populations is the apparent role of three species of very large copepods--*Neocalanus cristatus*, *N. plumchris,* and *Eucalanus bungi*--in transfering large amounts of energy from phytoplankton to higher trophic levels (Cooney, 1987; Short unpubl.). Available evidence led Cooney (1984) to postulate that the oceanic copepods are carried by Ekman transport from the open ocean onto the shelf over a large part of the year and may be an important source of organic matter for inshore organisms. He estimated that the advected biomass from March to November of each year was $10x10^6$ metric tons in the GOA, considerably higher than the estimated $2x10^6$ metric tons estimated from production on the shelf in the Alaska Coastal Current. With regard to interannual variability, Brodeur et al. (1996) found long-term fluctuations in zooplankton biomass that displayed maximal values on a 10+ year frequency. In Fig X-8 biomass of plankton for the spring and summer period are contrasted for a negative PDO period and a positive PDO period, and it can be seen that zooplankton biomass was much greater during the period.

Nonetheless primary and secondary productivity measurements in the GOA are few (e.g., Reeburg and Kipphut, 1987). Similar data on nekton also indicate that this group of organisms also was more abundant after about 1978. Both these observations are consistent with calculations by Polivinia et al. (1995) indicating that the reduction of the mixed-layer depth and increase of surface temperatures in the GOA would allow a doubling of pelagic production. With more to eat it is not surprising that survival and catches of Pacific salmon in the Alaska Gyre have increased so strongly since the late 1970s (Pearcy, 1992; Hare et al., 1999; Mantua et al., 1997)(Fig. 8). At the same time, there are indications that inshore production has been declining in many locations.

There is little known about decadal-scale changes in inshore rates of primary production, but there are efforts underway to compile what data that does exist (Mackas, personal communication). While the very favorable production regime for salmon in the central gulf was occurring, many, but not all, nearshore seabird and harbor seal colonies were in decline (e.g., Piatt and Anderson, 1996; Hatch et al., 1993)(Fig. 7). This was apparent in PWS, especially in data on black-legged kittiwakes from southern PWS (Irons, 1996). One compelling contrast from adjacent Cook Inlet was the decline over the last 20 years in seabirds at Chisik Island, while seabirds at Gull Island in Kachemak Bay were increasing during this period (Fig. X-1, Piatt, unpublished). High rates of nutrient supply from deep water enabled by exceptionally strong topographically focused, tidal-induced mixing in lower Cook Inlet and, at the same time, increased nutrient-poor freshwater inflows through upper Cook Inlet might explain these different regional 20-year trends in seabird abundance. Other long-term trends that may well impact biological productivity are the continuing increase of average surface-water temperatures in the north Pacific and an apparently greater frequency of strong El Niño events in recent years.



Spring



Summer

Biomass of plankton for the spring and summer period are contrasted for a negative PDO period (top) and a positive PDO period (bottom). Box A represents 100-200 g/1000 m^3 zooplankton biomass, Box B represents 201-300 g/m^3, and Box C represents >300 g/m^3.

f. Benthos

The GOA sea bottom supports a diverse community of bacteria, fungi, algae, some higher plants, invertebrates and fishes, and it varies with changes in substrate characteristics, depth, temperature, light and food supply (O'Clair and Zimmerman, 1987; Feder and Jewett, 1987). Primary production occurs in intertidal shallow subtidal communities. Benthic algal production is locally important in inshore areas of the northeastern Pacific. Productivity estimates for the NE Gulf of Alaska for large kelps (Nereocystis and Laminaria spp. range as high as 37.4-71.9 kg/m^2 /yr wet weight for Prince William Sound, to 2.1 kg/m^2 /yr wet weight for shallow intertidal Fucus and Rhodymenia spp. in Lower Cook Inlet, and 0 – 0.4 kg/m^2 /yr for deep subtidal areas containing Agarum and Callophyllis. This productivity is very important to maintaining nearshore communities in the areas where it occurs, however the majority of primary production in the GOA occurs in phytoplankton. The communities of the shelf bottom and shallow subtidal and intertidal environments support thousands of different species that recycle nutrients and carbon and participate in important geochemical cycles for trace substances. Climatic forcing may influence the nearshore-bottom communities in several ways, including through nutrients, larvae and food. Long time series data to

necessary to address these questions are available primarily for commercially utilized species of fish, crabs and molluscs (Hollowed and Wooster 1995; Zheng and Kruse In press). Data on the geology and biology of the benthos are also available from work preparatory to oil exploration in the Aleutians Islands and Alaska Peninsula, Kodiak, Cook Inlet, and northeastern Gulf of Alaska (OCSEAP 1990). References above to climate-mediated changes in production regimes and to changes in transport of organic matter apply to all these communities, whether they are at the bottom of the central GOA or in the intertidal zone of Cook Inlet. In addition, terrestrially mediated changes wrought by climate change, such as differences in the amount, timing and volume of freshwater discharge, sediment loads, and winter temperatures, would be expected to affect intertidal and nearshore communities

For the offshore seabed and its associated resources (e.g., epibenthic fish, crabs and shrimp), one might expect that changes in biological production in the surface-mixed layer, such as described earlier, might result in changes in the amount of organic matter reaching the sea floor. Between 1989 and 1996, a decline in the supply of particulate organic carbon to the abyssal eastern north Pacific has been reported (Smith and Kaufman, 1999). Also, variations in cyclonic circulation in the GOA and therefore in gyre Ekman-induced transport of surface water and its associated plankton, might change the amount of organic matter delivered to shelf communities. Mechanisms underlying the radical changes in the biological composition of nearshore communities in the GOA in the late 1970s and early 1980s (e.g., see Piatt and Anderson, 1996) are not known. It is possible, however, that the supply of organic matter to the shelf might have changed and this could have contributed to changes in seabed communities.

Many inshore communities have populations that rely on only occasional recruitment of successful age classes. The interplay of annually variable food supplies and currents may play significant roles in the success of larval production and their return to suitable habitats for the adult life stages. It may be, for example, that offshore loss of propagules is constrained when the Alaska Coastal Current stays close to the coast.

Sediments are also a major repository for organic matter and contaminants from human activity and may capture the history of climatic and geochemical events in the overlying waters. The intertidal zone, though very narrow, is a productive and unique component of the GOA ecosystem that feeds a variety of important populations, including people. Unfortunately, there appears to be no long-term record of intertidal community composition in the northern GOA.

2. Conceptual Model: How the System Works

a. Introduction

Every monitoring program by virtue of what, when, and where it samples, is based on some understanding or model of the system it attempts to characterize. Often the model is only implicit in the sampling scheme, but it can be presented as one or more hypotheses. An alternative approach--and the one followed here--is an explicit model of system behavior, containing a series of functional relationships that are expressed as interrelated testable hypotheses or questions about key parts of the system and the relationships among those parts.

Based mainly on the information presented in the background section (section IV.A), a conceptual model of how biological production and diversity vary in the GOA on time scales from years to centuries is presented below (see Fig. X-10 a,b). This model will be followed by a series of questions (section IV.C) that serve to conceptually reduce the system to linked components, each with several potential alternative behaviors.

Some parts of the following model are almost certainly valid and will be verified through further work in GEM and elsewhere. Other portions of this model probably will be rejected or modified based on reinterpretations of existing data or insights from new data. The ecosystem also may change in ways that are not anticipated based on past experience, as happened in the late 1970s. It also should be noted that while much of the focus of the background section was on the North Pacific Oscillation (NPO), the model described below will necessitate yearly measures of most of the parameters to capture any superannual cycle. So, for instance, Enfield (1997) summarized sea surface temperature trends into several coherent multiyear signals that affect the north Pacific Ocean: a 4-5 year ENSO mode, a Pacific interdecadal mode, and a global warming mode that appear to operate on very long time scales. Each of these would be expected to exert ecological effects and would be captured by the proposed program. Likewise, cyclic phenomena arising, for example, out of density-dependent population fluctuations in biological populations also would be captured.

Recognizing that the ecosystem under consideration is extremely complex and composed of tens of thousands of species, it will not be possible for this program to answer all, or even most, of the questions that could be posed about the GOA. However, it is focused on the system behavior that, based on the scientific literature and consultations with experts, seems to be most important for understanding the physical and biological processes responsible for biological production. The program also will be focused to a large extent on representative species in the system, picked on the basis of perceived ecological importance and human relevance, for in the end GEM must be justified on what it can tell us about how we should behave towards the ecosystem.

b. The Model

Any response model must start with the physical influences that drive the system. There are several candidates, which are perhaps not mutually exclusive, for external forcing factors: 1) Kelvin waves with a 4-5 year period underlying El Niño-La Niña phenomena, 2) atmospheric pressure changes with a 20-30 year oscillation (PDO), and 3) an 18.6-year lunar tidal node, and 4) long-term global warming. For purposes of this model, there may be enough confluence in the PDO and lunar cycle so that it is not important to specify which of these explanations (or both) are significantly affecting the ecosystem. Since the mechanisms through which the tidal node may be expressed in system oceanography are not as apparent or extensively elaborated (e.g., see Parker et al., 1995; Royer, 1993), much of the following discussion is based on atmospheric forcing that has been more extensively related to biological change, i.e. PDO. ENSO-related changes are still being described in the literature as a result of the recent events in the late 1990s. The following conceptual model describes the multi-decadal oscillation of production and consumption regimes in response to the PDO.

This model can be summarized as follows: In some decades the GOA is warm and windy with lots of precipitation. Under those conditions, offshore grazers, such as salmon, do well, but inshore grazers, such as seabirds and seals, do not thrive. In other decades, the GOA is cooler and less windy with less precipitation. Under those conditions, salmon do not do as well, but inshore seabirds and seals are favored. In addition, there are particularly warm and cold periods every few years (e.g., warm El Niños in 1983 and 1997), and both the decadal and El Niño-La Niña cycles are superimposed on a long-term warming trend in the north Pacific. The changes in ocean structure in response to climate alter the supply of nutrients, food production and transport. Inshore grazers do well when there is greater imported and local production, and offshore grazers do well when offshore production is good but does not get transported inshore. In addition, the long-term warming of the ocean may limit the extent of offshore habitat available to warm-intolerant salmon.

This model can be described in more detail as follows:

Northerly movement and intensification of the winter-time Aleutian low pressure system results generally in the following interrelated changes, known as positive Pacific Decadal Oscillation (PDO) (Fig. 2a):

1. Acceleration of cyclonic motion in the Alaskan subarctic gyre and increased shoreward surface water transport, specifically in the Alaska Current;

2. Increased mid-gyre upwelling of deep, nutrient-rich water to the ocean surface;

3. Entrainment of more of the west wind drift northward into the GOA Gyre via the Alaska Current, rather than into the California Current system to the south;

4. Deepened winter-time mixing of the surface layer in the central gulf;

5. Warmer surface water temperatures and increased heat flux;

6. Increased precipitation and coastal runoff;

7. Decreased surface water salinity, especially nearshore;

8. Increased winds and Ekman transport from the central gulf shoreward;

9. Increases in the intensity of the Alaska Coastal Current due to increased baroclinic and wind-driven transport;

10. Deepening of the Alaska Coastal current nearshore; and

11. Increased downwelling of the shoreward-driven surface water from the central gulf.

During the spring and summer the following differences also characterize a positive PDO:

1. The mixed layer in the central gulf rises rapidly and is shallower due to greater warming and greater stratification of the surface water;

2. Phytoplankton production is greater in the central gulf;

3. There is greater production and standing crops of zooplankton and nekton offshelf and in the central gulf;

4. More food is available on a year-round basis for pelagic-feeding fish, such as salmon, in the offshelf and in the central gyre and the effective habitat for salmon is expanded through a larger portion of the gulf;

5. Organic matter originating in the central gulf is carried shoreward by Ekman transport in much greater quantities, and then is downwelled more strongly before reaching the coast;

6. There is an increased supply of organic matter to the benthic communities in the outer shelf and slope from downwelled saline surface water;

7. Changes in the distribution of organic matter and water temperature on the shelf and slope force changes in the abundance and species composition of the benthic, epibenthic and pelagic communities;

8. Deepening freshwater influence and greater density stratification of inshore waters limit opportunities for bottom water renewal in enclosed coastal water bodies and to the inner shelf, but may be modulated by patterns of in-season winds;

9. Offshore downwelling fronts, less nutrient replenishment and stronger surface water stratification result in a lower exogenous supply and lower endogenous plankton production in nearshore waters;

10. Forage fish dependent on endogenous inshore production have less to eat and decline, especially fat-rich species whose populations depend on high levels of inshore production;

11. Forage-fish predators, such as harbor seals, sea lions and many sea bird species decline to the extent to which they depend on inshore production and cannot trophically access downwelled offshore production;

12. Fish predators, such as resident killer whales, which depend on offshore production (e.g., energy passed trophically through salmon) increase in abundance; and

13. Marine mammal predators, such as transient killer whales, undergo declines.

The physical and biological changes in a negative PDO index period are shown in Fig. 2b, in contrast to those shown in Fig 2a. Much of the model described above already appears in the literature as cited in the background section. However, the proposed inshore-offshore inverse production regimes and the transport and fate of the organic matter produced in response to the PDO, which are described in the context of a physically coherent ocean-climate model and which generally agrees with population trends in higher trophic-level organisms (e.g., salmon, seabirds and harbor seals), has not previously been described. That is, bottom-up controlled food webs in the two regimes respond to climate in generally opposite ways, with positive PDO indices being associated with greater offshore production and weaker nearshore production (1978-1990), and negative PDO indices (1948-1977) being associated with greater onshore production and weaker offshore production.

The fate of offshore production during the two regimes is key, with shoreward-transported organic production being downwelled more strongly onto the slope and outer shelf during the positive PDO index period. During the negative PDO index period there is less offshore production transported shoreward, but more organic production can reach the inner shelf and enclosed water bodies due to less downwelling, less water stratification, and more frequent opportunities for shoaling of offshore water derived from the central gulf onto the inner shelf.

It is proposed that the separation between onshore and offshore production regimes is at the offshore edge of the Alaska Coastal Current. The "ring of plankton"

often seen in sections near the shelf break may be a manifestation, in part, of transported, downwelled organic matter from the gulf that accumulates near the shelf (Cooney, 1987). The fate of this organic matter during different climate regimes is key to the oscillations in the model being proposed here. It is recognized that productivity of inshore plankton and nekton is generally higher than offshore productivity on an areal basis. However, trapping and accumulation of organic matter produced near the shelf break over a very large area of the central gulf presents a potent source of nourishment for animals on the shelf and slope environments. In fact, this source of nourishment is probably larger than the total nearshore production or organic matter. Cooney (1984, 1987) calculated that shoreward-advected zooplankton in the upper 50 m during the convergence season (October through April) was approximately $10x10^6$ metric tons. This compares to $2x10^6$ metric tons produced in the Alaska Coastal Current, a five-fold difference. The fate of this material may have potent implications for seabirds and juvenile fish that can access it.

Recently a mechanistic hypothesis has been advanced to explain the decadal scale variation in eastern North Pacific salmon stocks (Gargett 1997). Gargett proposes that increased precipitation in coastal areas during positive PDO's makes the water column more stable and that this increased stability promotes greater primary production. Polovina (19) has proposed a similar hypothesis for the central GOA, and this ultimately results in more salmon production. This hypothesis is based on the assumption that greater water column stability enhances retention of phytoplankton without sacrificing the nutrient supply necessary for the higher rate of primary production.

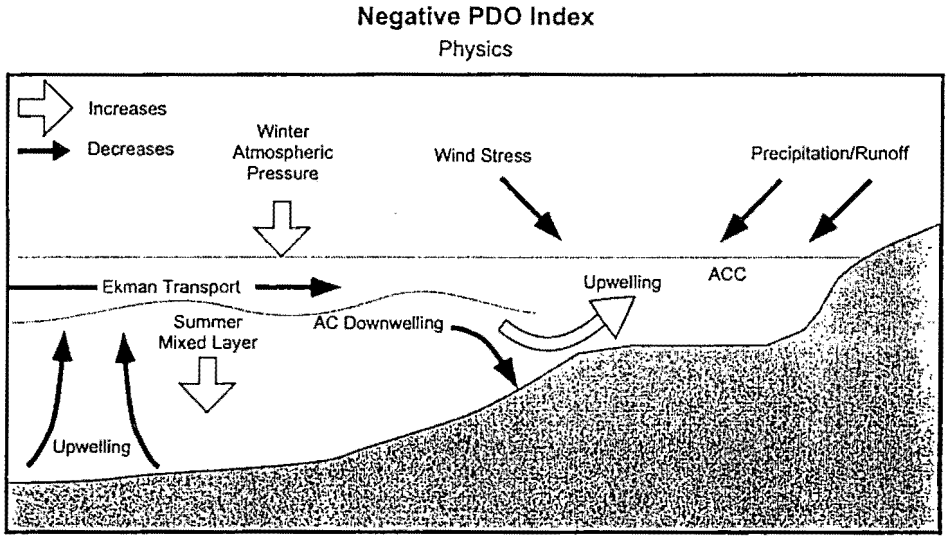
The "optimal stability window" hypothesis is closely related to what is proposed here, with several differences. First because of the tendency for waters of the Alaska Coastal Current to become nutrient limited, we are proposing that increased water column stability during positive PDO's will result in net production decreases, in contrast to the increases expected in the central GOA. Second, while Gargett proposes that greater salmon production results from favorable productcity in coastal waters, where many salmonids spend their firs year at sea, our hypothesis would explain abundanct food on the outer shelf as a result of onshore transport of offshore production, i.e. Cooney's ring of zooplankton production. If increased salmon production results from favorable productivity in coastal waters, where many salmon spend their first year at sea, our hypothesis would explain abundant food on the outer shelf as a result of onshore transport of offshore production, i. e. Cooney's "ring of zooplankton." Is the carbon in the Alaska Coastal Current during a positive PDO due to *in situ* production or onshore transport? Resolving which if either of these two hypotheses is correct depends on knowing the origin of the carbon available to salmon on the shelf.

If the source of increased carbon during a positive PDO is due to onshore transport, then juvenile salmon would have access to the imported production before it is

lost to downwelling near the shelf break. Unfortunately it does not appear there are data available to distinguish which hypothesis is correct.

It should also be recognized that the model presented here attempts to provide a mechanistic explanation of how the largest climate signal (PDO) could cause the biological changes that are correlated with it. It is to be expected that effects of El Nino - LaNina cycles and the long term global warming evident throughout the Pacific will interact in potentially complex ways with PDO cycles. It will be important to expand, modify or totally reverse the model as new insights accumulate.

In addition to models based on water column stability and bottom-up control of higher trophic levels, there are the direct effects of water temperature on the physiology of the organism that could alter trophic dynamics, or the geographic range of important organisms. For example, Welch (199_) has proposed that global climate warming could drastically restrict the range of sockeye salmon in the next several decades.


Negative PDO Index
Physics
Increases
Decreases
Winter
Atmospheric
Pressure
Wind Stress
Precipitation/Runoff
Ekman Transport
Upwelling
ACC
Summer
Mixed Layer
AC Downwelling
Upwelling

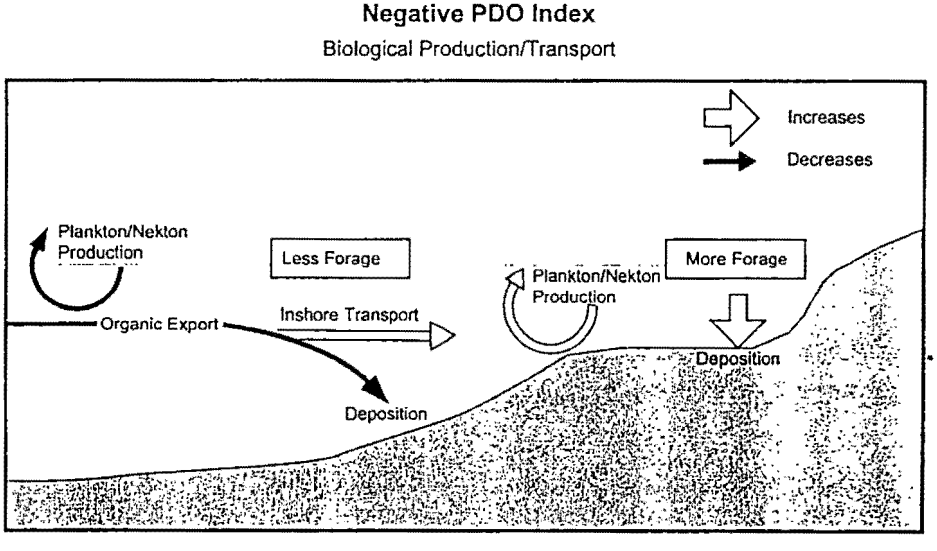
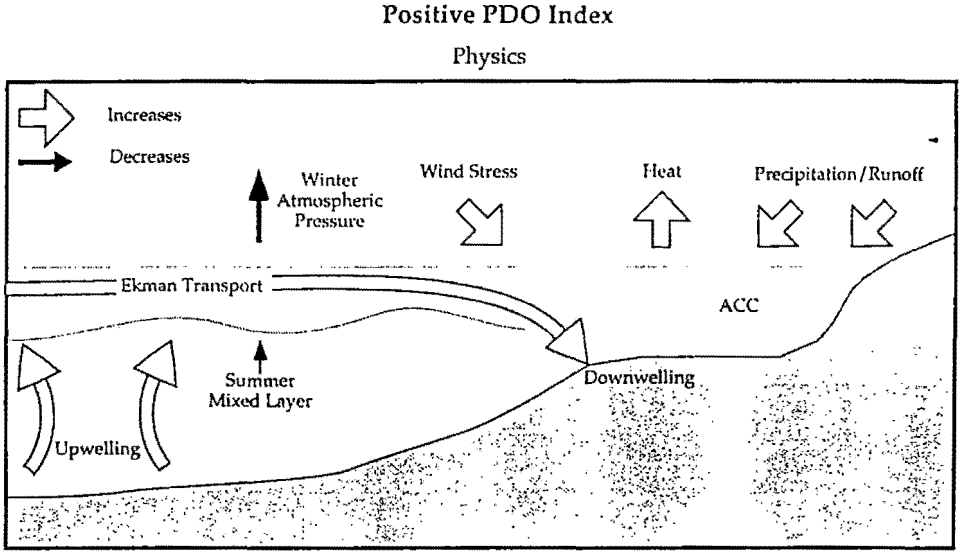

Negative PDO Index
Biological Production/Transport
Increases
Decreases
Plankton/Nekton
Production
Less Forage
Plankton/Nekton
Production
More Forage
Organic Export
Inshore Transport
Deposition
Deposition

Figure X-9a.


Positive PDO Index
Physics
Increases
Decreases
Winter Atmospheric Pressure
Wind Stress
Heat
Precipitation/Runoff
Ekman Transport
ACC
Summer Mixed Layer
Downwelling
Upwelling

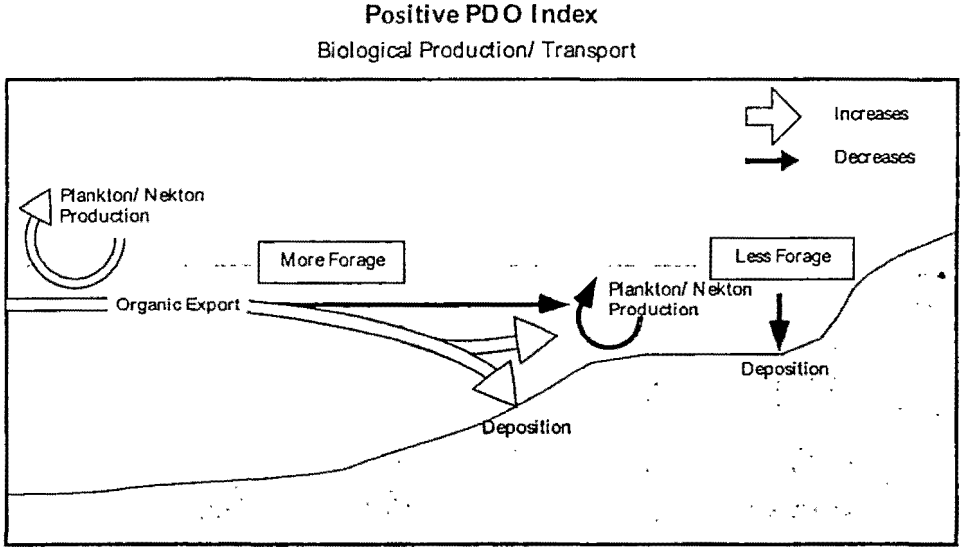

Positive PDO Index
Biological Production/ Transport
Increases
Decreases
Plankton/ Nekton Production
More Forage
Less Forage
Organic Export
Plankton/ Nekton Production
Deposition
Deposition

Figure X-9b.

E. Scientific Questions

In the context of the conceptual model described above, the following questions are meant to capture some of the main uncertainties in how fluctuations in the GOA ecosystem influence the distribution and abundance of valued organisms. The questions do not attempt to capture the entire scope of potential monitoring and research projects, but rather they address discrete aspects of the proposed model and are related to one another. There are other questions that could be posed and other ways to frame the uncertainties, so this should be considered an initial effort. Questions marked with an asterisk (*) are considered fundamental to the core monitoring program. Although a specific model has been postulated to explain ecological change in the northern Gulf of Alaska, the following questions are broad enough to capture major ecosystem changes whatever the mechanisms.

1. Climate, sea-surface interactions and physical oceanography

a. What are the periodic and aperiodic changes in the atmosphere that influence the northern GOA?* Are they predictable ? How will the trend in global warming affect cycles in the future?*

b. What is the annual, interannual, and interdecadal variability in the position and strength of the Alaska Coastal Current?* What is the annual, interannual, and interdecadal variability in the Alaska Current and Alaska Stream?*

c. How is downwelling of onshore-driven water and upwelling of deep water affected by changes in wind and coastal precipitation during different climatic regimes? Does freshwater-induced stratification and wind-induced mixing on the continental shelf change significantly under various climatic regimes?

d. How do fronts and eddies affect biological production and onshore-offshore transport?

e. How do nearshore and shelf exchange processes change over time and what are the biological consequences of such changes?

f. What are the fluctuations in freshwater input to the coastal gulf and how do these changes affect circulation, stratification, and inshore-offshore exchange?

2. Ocean fertility and plankton

a. How are nutrient transport and recycling in the central GOA and on the shelf different in different climate regimes?*

b. What are the relative roles of local nutrient recycling versus deep-water supply and cross-shelf transport in PWS, Cook Inlet and Kodiak Island?

c. Does the intense upwelling in outer Cook Inlet vary significantly interannually or interdecadally ?* Do long-term changes in some tidal nodes (e.g., an 18.6-year nodal cycle) affect nutrient supply in this region?

d. Are PWS, Cook Inlet and the Kodiak shelf net importers or net exporters of nutrients, carbon and energy ?

e. How does the timing, magnitude, duration, and species composition of the spring bloom respond to seasonal and interannual variability in nutrient supply and physical conditions?

f. What is the zooplankton community response to seasonal and interannual variability in phytoplankton? What is the fate of offshelf zooplankton production under different climate regimes?

g. What combinations of physical conditions and primary and secondary production lead to favorable conditions for higher trophic level consumers (fish, birds, mammals), and what is the spatial and temporal variability and frequency of occurrence of these combinations?

h. What are the relative contributions of the net plankton, microheterotrophs, and bacteria in the overall energy budget of the ecosystem?

3. Fish and fisheries

a. What are mechanisms responsible for interannual and interdecadal variations in populations of major species of forage fish (herring, pollock, capelin and eulachon) in the GOA?*

b. What is the balance between nearshore survival of juvenile salmon and survival through the remainder of the life cycle in the GOA in determining fluctuations in salmon returns in the region ?

c. Are there particular combinations of periods of wind-free, onshore transport of deep water with high nutrient content and periods of wind-driven mixing that prevent prolonged stratification of surface water that are optimal for inshore survival of young herring and salmon?*

d. Does enhanced late-season plankton production favor survival of 0+ age class fish?

e. How important to overwintering survival of forage fish are warm winter water temperatures and holdover zooplankton production?

f. What is the long-term effect of salmon hatcheries on the allocation of pelagic food resources in the GOA?

"[Trophic dynamic] Process-oriented studies in the North Pacific ... are urgently needed. Investigations on plankton dynamics and early life histories of fish and shellfish should be undertaken so that mechanisms for subsequently observed changes in fish, shellfish, bird, and marine mammal populations can be understood." (p. 62 Kruse 1998) At-sea research is urgently needed on the biotic implications of these [climatic and nutrient transport] conditions, from effects on primary and secondary producers to effects on invertebrates, fish, birds, and marine mammals through the pelagic and benthic food webs. (p. 55 Kruse 1998)

4. Benthic and intertidal communities

a. How do populations and productivity of benthic and intertidal communities fluctuate interannually and interdecadally?*

b. What conditions cause fluctuations in the fraction of the spring bloom that falls ungrazed to support the benthic fish and invertebrate community?

c. How does nutrient supply to nearshore plants fluctuate?

5. Bird and mammal populations

a. How do populations and productivity of seabirds fluctuate interannually and interdecadally?* Is the availability of fatty forage fishes (e.g., herring, capelin and eulachon) in the shelf environment the main determinant of population success?*

b. How do populations and productivity of harbor seals fluctuate interannually and interdecadally?*

c. Do populations of harbor seals fluctuate with the availability of fatty forage fishes (e.g., herring, capelin and eulachon) in the shelf environment ?

d. How do populations and productivity of sea otters fluctuate interannually and interdecadally?* Does food supply play the main role, or do disease and predation?

e. To what extent does transport of marine nitrogen from the GOA determine or limit the production of terrestrial bird and mammal populations?

f. "[Trophic dynamic] Process-oriented studies in the North Pacific ... are urgently needed. Investigations on plankton dynamics and early life histories of fish and shellfish should be undertaken so that mechanisms for subsequently observed changes in fish, shellfish, bird, and marine mammal populations can be understood." (p. 62 Kruse 1998) At-sea research is urgently needed on the biotic implications of these [climatic and nutrient transport] conditions, from effects on primary and secondary producers to effects on invertebrates, fish, birds, and marine mammals through the pelagic and benthic food webs. (p. 55 Kruse 1998)

6. Anthropogenic and natural contaminants

a. What are the concentrations of bioaccumulated anthropogenic chemicals in the coastal and shelf organisms? *

b. What is the loss rate of residual EVOS hydrocarbons from the spill area?*

c. Are anthropogenic chemicals having adverse effects on the health of marine organisms, especially apex predators with high accumulations of persistent synthetic chemicals?

d. What are the concentrations of bioaccumulated natural toxins, such as domoic acid, in the coastal and shelf environment?

e. Are natural toxins having adverse effects on the health of marine organisms, such as killer whales and other apex predators with high accumulations of persistent synthetic chemicals?

F. Approach to Long-term Monitoring

The main purpose of the GEM program is to pursue and support the collection of a core of long-term measurements sufficient to track ecosystem changes in processes and species of interest on the scale of decades. At the same time, GEM seeks to conduct shorter-term research to clarify functional relationships within the ecosystem so that changes in monitoring programs may be made to reflect the utility of the monitoring programs to research and management. Subject to periodic review, there is a need to maintain a core of measurements taken with enough consistency in time and space to be able to make conclusions about changes that occur several times a century. Results from the research program, however, should also inform the monitoring program, so that it may be changed or augmented to reflect the most accurate, up-to-date understanding of the functional processes that should be monitored and the technologies available to monitor those processes. There will always be a dynamic balance between the need for continuity and making the monitoring program most reflective of our latest understanding of how the system functions and where, when and how it is best measured.

It needs to be emphasized that GEM is unlikely to directly support the bulk of the monitoring necessary to track ecosystem changes in processes and species of interest on the scale of decades. The approach recommended here is to 1) determine the best or "top" hypotheses to explain the interaction of physical and biological processes to produce species of interest, and what data are presently being gathered to evaluate these hypotheses, 2) to conduct statistical and logistical research to determine the monitoring opportunities where GEM may most efficiently contribute to evaluating top hypotheses, 3) leverage GEM funding using the fulcrums of logistic and financial support provided by existing agencies 4) craft a program of monitoring and related research that is appropriate to the cash flow expected from the endowment.

The following are suggested as areas of interest. Where other programs are not now fully addressing these areas, there may be opportunities for the GEM monitoring program.

1. Climate

To measure: intensity and location of the winter Aleutian Low Pressure system; wind speed and direction, air temperature and relative humidity at several key sites; precipitation and coastal freshwater input to the GOA. Possible cooperators: the NOAA (buoy system, National Weather Service), NCAR, USGS coastal stream gauge data; use of existing local precipitation and air temperature records.

2. Physical oceanography

To measure: strength, location and variation of Alaska Current/Stream and Alaska Coastal Current at key sites; variation in the circulation of PWS and lower CI (including eddy formation); the upwelling index along the whole Gulf Coast; synoptic sea surface temperatures periodically throughout the study area and salinity/temperature/density profiles or sections to depth at selected sites. Possible cooperators: NOAA (COP, OCC, FOCI, GLOBEC, buoy data, Coastwatch Remote Sensing Program), NSF (Snow and Ice Data Center), Canadian GLOBEC, US GLOBEC, UAF (GAK line), MMS.

3. Chemical oceanography

To measure: NO_3, PO_4 and iron concentrations and selected tracers (e.g., isotope tracers) at key locations and times in GOA, on the shelf and in CI and PWS. Possible cooperating agencies/programs: UAF.

To measure concentrations of PCBs, DDT, and other persistent organic chemicals in mussels and tissues of APEX predators. Possible cooperating agencies/programs: NOAA (National Status and Trends Program--Mussel Watch), NMFS Seattle Laboratory; Prince William Sound and Cook Inlet RCACs.

4. Biological oceanography

To characterize: chlorophyll *a* (continuous) and primary productivity at key sites in the Gulf, on shelf, in PWS and CI; to obtain synoptic views of sea surface chlorophyll *a*. Possible cooperating agencies: NOAA/NMFS (FOCI, Coast Watch), DFO Canada, NASA, UAF, PWS Aquaculture Corporation.

To measure: zooplankton settled volume at inshore sites within PWS, CI and Kodiak, and zooplankton hydroacoustic biomass and net plankton on the shelf and adjacent waters at key times. Collections are expected to include icthyoplankton and larvae of important macroinvertebrates. Sample subsets to be analyzed for species composition. Periodic modeling of bloom dynamics. Possible cooperating agencies: PWS Aquaculture Corporation, US GLOBEC, GLOBEC Canada.

5. Nekton

To make estimates of biomass and species composition by hydroacoustic and net sampling on the shelf and within PWS and CI at key sites and times. Possible cooperating agencies/programs: US GLOBEC, UAF, FOCI, NOAA/NMFS.

6. Forage fish

To monitor: halibut and Pacific cod stomach contents in CI and other possible regions; seabird diets in PWS and CI (summer); juvenile herring surveys in PWS. To do hydroacoustic and net sampling at key shelf sites. Goal: An index of species composition and relative species composition and relative abundance of forage fishes. To measure carbon and nitrogen stable isotopes and fatty acids of herring and other forage fish on shelf and in PWS and CI. To do biophysical modeling to help predict herring and pollock stock composition and size. Possible cooperating agencies/programs: ADF&G, NOAA/NMFS, MMS.

7. Other fish and crustaceans

To obtain: commercial catch statistics and stock assessment data for salmon, herring, pollock, sablefish, Pacific cod, rockfish, and other species, including crabs and shrimp, in PWS, Kodiak, and CI. When available, supplement with additional data from sport and subsistence harvests. Possible cooperating agencies/programs ADF&G, NOAA/NMFS.

8. Inshore benthic and intertidal communities

To monitor: Annual abundance and productivity of selected subtidal and intertidal organisms, such as clams, polychaetes, and crustaceans, at locations in PWS, Kodiak and

LCI. Relate retention and transport phenomena to larval supply and recruitment. Possible cooperating agencies/programs: MMS, PWS and CI RCACs.

9. Apex predators

To monitor: seabird colony attendance every 4 years and chick productivity every year at established USFWS GOA index colony sites (e.g., Barren Islands) within the spill area for at least common murres and black-legged kittiwakes. Also total seabird guild composition and abundance at major index sites. Occasional at-sea counts of seabirds. Possible cooperating agencies/programs: USGS/BRD, USFWS/Alaska Maritime National Wildlife Refuge Seabird Monitoring Program, US GLOBEC (?), MMS.

To conduct regular periodic surveys of harbor seal molting at select sites across the northern GOA coast (e.g., PWS, outer Kenai coast, CI, Kodiak) accompanied by biological studies to assess body condition and other factors likely to be indicative of population status. Possible cooperating agencies/programs: NMFS, ADFG, NPS, UAF.

It will be important to continue periodic monitoring and further understanding of how and possibly why some species of predators fluctuate in abundance. Sea otters and killer whales are possible candidates and currently ecosystem trophic modeling may point towards one of these species as an important ecosystem component. Possible cooperating agencies/programs: USGS BRD, NMFS, USFWS, ADFG.

V. Literature Cited

ARMRB, Alaska Regional Marine Research Board. 1993. Alaska Research Plan. Alaska Regional Marine Research Board, School of Fisheries and Ocean Sciences, University of Alaska, Fairbanks.

Anderson, G.C., R.K. Lam, B.C. Booth and J.M. Glass. 1977. A description and numerical analysis of the factors affecting the processes of production in the Gulf of Alaska: final report. Research Unit 58. Environmental Assessment of the Alaska Continental Shelf, Annual Reports of Principal Investigators for the Year ending March 1977 7 (Receptors, fish, littoral, benthos): 477-798.

Anderson, P.J. and J. F. Piatt, 1999. Community reorganization in the Gulf of Alaska following ocean climate regime shift. Mar. Ecol. Prog. Ser (in press).

Beklemishev, A.E. 1957. The spatial relationships of marine zoo- and phytoplankton. Tr. Inst. Okeanol. Akad. Nauk SSSR 20, 253-378.

Booth, B.C., J. Lewin, and J.R. Postel. 1993. Temporal variation in the structure of autotrophic and heterotrophic communities in the subarctic Pacific. Prog. Oceanog. 32, 57-99.

Brodeur, R.D. and D.M. Ware. 1992. Long-term variability in zooplankton biomass in the subarctic Pacific Ocean. Fish. Oceangr. 1, 32-38.

Brodeur, R.D., B.W. Frost, S.R. Hare, R.C. Francis and W.J. Ingram, Jr. 1996. Interannual variations in zooplankton biomass in the Gulf of Alaska and covariation with California Current zooplankton biomass. CalCOFI Rep. 37: 80-100.

Bowen et al. 1999. Report of the Independent Review of the Scientific Bases for the 3 December 1998
Biological Opinion Regarding Interactions between Steller Sea Lions and Bering Sea and Gulf of Alaska Pollock Fisheries. North Pacific Fishery Management Council, Anchorage, AK.

Calkins. D. 1987. Marine mammals, pp. 527-558, *in The Gulf of Alaska, Physical Environment and Biological Processes* (D.H. Hood and S.T. Zimmerman, Eds.), OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

Carlson, P.R., T.R. Burns, B.F. Molnia, and W.C. Schwab. 1982. Submarine Valleys in the northeast Gulf of Alaska: characteristics and probable origin. Mar. Geol. 47, 217-242.

Chester, A.J. and J.D. Larrance. 1981. Composition and vertical flux of organic matter in a large Alaskan estuary. Estuaries 4: 42-54.

Clark, W.G., S.R. Hare, A.M. Parma, J. Sullivan, and R.J. Trumble. (Draft). Decadal changes in growth and recruitment of Pacific halibut (Hippoglossus stenolepis). Available on IPHC webpage: http://www.iphc.washington.edu/halcom/research/environ/abst_dec.html.

Colloquium on El Nino-Southern Oscillation (ENSO): Atmospheric, oceanic, societal, environmental and policy perspectives. July 20-August 1, 1997, Boulder, Colorado. World-wide web address: (http://www.dir.ucar.edu/esig/enso/day01_mon.html)

Cooney, R.T. 1984. Some thoughts on the Alaska coastal current as a feeding habitat for juvenile salmon, pp. 256-258 In: The influence of ocean conditions on the Production of Salmonids in the North Pacific. (W.C. Pearcy, Ed.) Sea Grant Program, ORESU-W-83-001. Oregon State University, Corvallis, Oregon.

Cooney, R.T. 1987. Zooplankton, pp. 285-303, *in The Gulf of Alaska, Physical Environment and Biological Processes* (D.H. Hood and S.T. Zimmerman, Eds.), OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

DeGange, A.R. and G.A. Sanger. 1987. Marine birds. pp. 479-526, *in The Gulf of Alaska, Physical Environment and Biological Processes* (D.H. Hood and S.T. Zimmerman, Eds.), OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

DOI-NOAA-ADF&G, U.S. Department of the Interior, National Oceanic and Atmospheric Administration, Alaska Department of Fish and Game. 1997. Bering Sea Ecosystem Workshop Report. Anchorage, AK December 4-5, 1997. ADF&G, Commercial Fisheries Division, Juneau.

DOI-NOAA-ADF&G, U.S. Department of the Interior, National Oceanic and Atmospheric Administration, Alaska Department of Fish and Game. 1998a. Draft Bering Sea Ecosystem Research Plan. ADF&G, Commercial Fisheries Division, Juneau.

DOI-NOAA-ADF&G, U.S. Department of the Interior, National Oceanic and Atmospheric Administration, Alaska Department of Fish and Game. 1998b. Bering Sea Ecosystem – A Call to Action. ADF&G, Commercial Fisheries Division, Juneau.

Dugdale, R.C. 1967. Nutrient limitation in the sea: dynamics, identification and significance. Limnol. Oceangr. 12, 685-695.

Emery, W.J. and K. Hamilton. 1985. Atmospheric forcing of interannual variability in the northeast Pacific Ocean: Connections with El Ñino.

Enfield, D. 1997. Multi-scale climate variability: Besides ENSO, what else?, in A

Erlington (?)

Esslinger, D. 1999. Biophysical modeling and validation through remote sensing, in Sound Ecosystem Assessment (SEA)-An integrated science plan for the restoration of injured species in Prince William Sound. Draft final report for Project 99320. EVIS Restoration Office, Anchorage, Alaska.

Favorite, F., A.J. Dodimead and K. Nasu. 1976. Oceanography of the subarctic Pacific region, 1960-71. Internation North Pacific Fisheries Commission Bulletin No. 33, 187 pp.

Feder, H. M. and S.C. Jewett. 1987. The subtidal benthos, pp. 347-398, *in The Gulf of Alaska, Physical Environment and Biological Processes* (D.H. Hood and S.T. Zimmerman, Eds.), OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

Francis, R C.. and S.R. Hare. 1994. Decadal-scale regime shifts in the large marine ecosystems of the Northeast Pacific: A case for historical science. Fisheries Oceanography 7: 1-21.

Francis, R. C., S. R. Hare, A. B. Hollowed, and W. S. Wooster. 1998. Effects of interdecadal climate variability on the oceanic ecosystems of the NE Pacific. Fisheries Oceanography 7(1):1-21.

Frost, K.J., L.F. Lowry and J. M. VerHoef. 1997. Monitoring, habitat use and trophic interactions of harbor seals in Prince William Sound. Restoration Project 97064, Annual Report. Exxon Valdez Oil Spill Restoration Office, Anchorage, Alaska.

Frost, K.J., L.F. Lowry, R.J. Small and J. Ver Hoef. 19__. Monitoring the trend of harbor seals in Prince William Sound Alaska after the *Exxon Valdez* oil spill. Mar. Mammal Sci. (in press).

Furness, R.W., and C.J. Camphuysen. 1997. Seabirds as monitors of the marine environment. ICES J. Mar. Sci. 54: 726-737.

Gardner, J. V., P. K. Butman, L. A. Mayer, and J. H. Clarke. 1998. Mapping U. S, continental shelves enabled by high resolution multibeam systems, adbvances in data processing, USGS begins systematic mapping program. Sea Technology, June:10-17.

Gargett, A. 1997. Optimal stability window: A mechanism underlying decadal fluctuations in north Pacific salmon stocks. Fisheries Oceanography 6:109-117.

Hampton, M.A., P.R. Carlson and H.J. Lee. 1987. Geomorphology, sediment and sedimentary processes, pp. 93-143, *in The Gulf of Alaska, Physical Environment and Biological Processes* (D.H. Hood and S.T. Zimmerman, Eds.), OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

Hare, S.R., N.J. Mantua and R.C. Francis. 1999. Inverse production regimes: Alaska and west coast pacific salmon. Fisheries 24: 6-14.

Hatch, S.A., G.V. Byrd, D.B. Irons, G.L. Hunt. 1993. Status and ecology of kittiwakes in the North Pacific Ocean, pp. 140-153 in K. Vermeer, K.T. Briggs, K.H. Morgan and D. Siegel-Causey, Eds., The status, ecology and conservation of marine birds of the North Pacific, Canadian Wildlife Service, Special Publication, Ottawa.

Hattori, A. and E. Wada. 1972. Assimilation of inorganic nitrogen in the euphotic layer of the north Pacific Ocean, pp. 279287, In: *Biological Oceanography of the North Pacific Ocean*. A.Y. Takenoti, Ed. Idemitsu Shoten, Tokyo.

Heggie, D.T. and D.C. Burrell. 1981. Deepwater renewals and oxygen consumption in an Alaskan Fjord. Estuarine , Coastal and Shelf Science 13, 83-99.

Heinrich, A.K.. 1957.The breeding and development of the dominant copepods in the Bering Sea. Tr. Veses. Gidrobiol. Obsh. 8, 143-162.

Hollowed, A. B. and W. S. Wooster . 1992. Variability of winter ocean conditions and strong year classes of Northeast Pacific groundfish. ICES Marine Science Symposium, 195:433-444.

Hollowed, A. B. and W. S. Wooster . 1995. Decadal-scale variations in the eastern subarctic Pacific II. Response of Northeast Pacific fish stocks. In R. J. Beamish (ed.) Climate change and northern fish populations, pp. 373-385. Canadian Special Publication of Fisheries and Aquatic Sciences, 121.

Hood, D. W. and S. T. Zimmerman, (Eds.), 1986. The Gulf of Alaska Physical Environment and Biological Resources. OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

Ingraham, W.J., Jr., R.K. Reed, J.D. Schumacher and S.A. Macklin. 1991 EOS, Trans., Amer. Geophys. Union 72, 257-264.

Irons, D.B. 1996. Size and productivity of Black-legged kittiwake colonies in Prince William Sound before and after the Exxon Valdez oil spill, *Proceedings of the* Exxon Valdez *Oil Spill Symposium* (S.D. Rice, R.B. Spies, D.A. Wolf and B.A. Wright, Eds.) American Fisheries Society Symposium 18: 738-747.

Klein, W.H. 1957. Principal tracks and mean frequencies of cyclones and anti-cyclones in the Northern Hemisphere. Research Paper Number 40, US Weather Bureau US Government Printing Office, Washington, D.C., 60 pp.

Kruse, G. H. 1998. Salmon run failures in 1997-1998: a link to anomalous ocean conditions? Alaska Fishery Research Bulletin 5(1):55-63.

Larrance, J.D. and A.J. Chester. 1979. Source, composition and flux of organic detritus in lower Cook Inlet. Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators 46: 1-71.

Mantua, N.J., S.R. Hare, Y. Zhang, J.M. Wallace and C. R. Francis. 1997. A Pacific Interdecadal climate oscillation with impacts on salmon production. Bull. Amer. Meterol. Soc. 78: 1069-1079.

Mantyla and Reid. 1983. Abyssal characteristics of the world ocean waters. Deep-Sea Res. 30:805-833.

Mann, K. H. 1982. Ecology of Coastal Waters. Blackwell, Oxford.

McEwen, G.F., T.G. Thompson, and R. VanCleve. 1930. Hydrographic patterns and circulation currents in the Gulf of Alaska, 1927 and 1928. Report of the International Fisheries Commission 4: 5-36.

Miller, C.B. 1993. Pelagic production processes in the subarctic Pacific. Prog. Oceanog. 32, 1-15.

Miller, C.B. B.W. Frost, P.A. Wheeler, M.R. Landry, N. Welschmeyer and T.M. Powell. 1991. Ecological dynamics in the subartic Pacific, possibly iron limited system. Limnol. Oceanogr. 36, 1600-1615.

Molnia, B.F. 1981. Distribution of continental shelf surface sedimentary units between Yakutat and Cross Sound, northeastern Gulf of Alaska.

Muench, R.D. and Heggie, D.T. 1978. Deep water exchange in Alaskan subarctic fjords, pp. 239-267, in: *Estuarine Transport Processes,* (B. Kjerfve, Ed.) B. Baruch Institute for Marine Biology and Coastal Research, Univ. So. Carolina Press, Columbia SC.

Niebauer, H.J., T.C. Royer and T.J. Weingartner. 1994. Circulation of Prince William Sound, Alaska. J. Geophys. Res. 99, 113-114.

NPFMC, North Pacific Fishery Management Council. 1999. Livingston, P. (ed.) Appendix D, Preliminary Ecosystem Considerations for 2000. Groundfish Plan Teams Annual SAFE Reports. NPFMC, Anchorage, AK.

O' Clair, C. and S.T. Zimmerman. 1987. Biogeography and ecology of the intertidal and shallow subtidal communities, pp. 305-346, *in The Gulf of Alaska, Physical Environment and Biological Processes* (D.H. Hood and S.T. Zimmerman, Eds.), OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

OCSEAP, Outer Continental Shelf Environmental Assessment Program. 1990. Comprehensive Bibliography. U.S. Department of the Interior, Minerals Management Service, Anchorage, AK.

Parker, K.S., T.C. Royer and R.B. Deriso. 1995. High-latitude climate forcing and tidal mixing by the 18.6-year lunar nodal cycle and low-frequency recruitment trends in Pacific halibut (Hippoglosus stenolepis),in Climate change and northern fish populations (Beamish, Ed.). Can. Spec. Publ. Fish. Aquat. Sci 121: 447-458.

Pauly, D. and V. Christensen. 1995. Primary production required to sustain global fisheries. Nature 374, 255-257.

Pearcy, W.G. 1992. Ocean ecology of North Pacific salmonids. Washington Sea Grant Program. University of Washington Press. 179 pp.

Phillips, Phillips, R.A., R. G. W. Caldow, and R.W. Furness. 1996. The influence of food availability on the breeding effort and reproductive success of Arctic skuas Stercorarius parasticus. Ibis 138: 410-419.

Piatt, J.F. and P. Anderson. 1996. Response of common murres to the *Exxon Valdez* oil spill and long-term changes in the Gulf of Alaska marine ecosystem, pp. 720-737, in *Proceedings of the* Exxon Valdez *Oil Spill Symposium* (S.D. Rice, R.B. Spies, D.A. Wolf and B.A. Wright, Eds.) American Fisheries Society Symposium 18: 720-737.

Pitcher, K.W. 1990. Major decline in the number of harbor seals, *Phoca vitulina richardsi*, on Tugidak Island, Gulf of Alaska. Mar. Mam. Sci. 6: 121-134.

Polivina, J.J., G.T. Mitchum and G.T. Evans. 1995. Decadal and basin-scale variation in mixed layer depth and impact on biological production in the Central and North Pacific, 1960-88. Deep Sea Res. 42, 1701-1716.

Polivina, J.J., G.T. Mitchum, N.E. Graham, M.P. Craig, E.E. DeMartinin and E.N. Flint. 1994. Physical and biological consequences of a climate event in the central North Pacific.Fish. Oceanr. 3, 15-21.

Reeburg, W.S. and G.W. Kipphut. 1987. Chemical distributions and signals in the Gulf of Alaska, its coastal margins and estuaries, pp. 77-91, *in The Gulf of Alaska, Physical Environment and Biological Processes* (D.H. Hood and S.T. Zimmerman, Eds.), OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

Reed, R.K. and J.D. Schumacher. 1987. Physical Oceanography, pp. 57-75, *in The Gulf of Alaska, Physical Environment and Biological Processes* (D.H. Hood and S.T. Zimmerman, Eds.), OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

Reid, J.L. Jr. 1965. Intermediate waters of the Pacific Ocean. The Johns Hopkins Oceanographic Studies.

Reitan, C.H. 1974. Frequency of cyclones and cyclogenesis for North America. Monthly Weather Review 102: 861-868.

Richardson, R.W. 1936. Winter air-mass convergence over the North Pacific. Monthly Weather Review 64: 199-203.

Rogers, J.C. 1981. The North Pacific Oscillation. Journal of Climatology 1: 39-57.

Royer, T.C. 1979. On the effect of precipitation and runoff on coastal circulation in the Gulf of Alaska. J. Phys. Ocean. 9: 555-563.

Royer, T.C. 1981. Baroclinic transport in the Gulf of Alaska. Part II. A freshwater-driven coastal current. J. Mar. Res. 39: 251-266.

Royer, T.C. 1982. Coastal freshwater discharge in the northeast Pacific. J. Geophys. Res. 87C:2011-2021.

Royer, T.C. 1983. Northern Gulf of Alaska. Rev. Geophys. Space Phys. 21: 1153-1155.

Royer, T.C. 1993. High-latitude oceanic variability associated with the 18.6 year nodal tide. J. Geophy. Res. 98: 4639-4644.

Sambratto, R.N. and Lorenzen, C.J. 1987. Phytoplankton and primary production, pp. 249-282, *in* The Gulf of Alaska, Physical Environment and Biological Processes (D.H. Hood and S.T. Zimmerman, Eds.), OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

Schumacher, J.D., P.J. Stabeno and S.J. Bogard. 1993. Characteristics of an eddy over the continental shelf: Shelikof Strait, Alaska. J. Geophys. Res.: 98: 8395-8404.

Senner, S. 1999. Converging north: dunlins and western sandpipers on the Copper River Delta. pp. 135-148 *in* Gatherings of Angels: Migrating Birds and Their Ecology (K.P. Able, ed.), Comstock Books, Ithaca, New York.

Short (unpublished)

Smith, K.L. Jr. and R.S. Kaufman. 1999. Long-term discrepancy between food supply and oxygen demand in the deep eastern North Pacific. Science 284: 1174-1177.

Sverdrup, H.U., M.W. Johnson and R.H. Fleming. 1942. The Oceans: Their Physics, Chemistry and General biology. Prentice Hall, New York, N.Y. 1087 pp.

Treidl, , R.A., E.C. Birch and P. Sajecki. Blocking action in the northern hemisphere: a climatological study. Atmosphere-Ocean19, 1-23.

Trenbreth, K.E. and J.W. Hurrel. 1994. Decadal atmospheric-ocean variations in the Pacific. Climate Dynamics 9, 303-319.

Trites, A. W. 1992. Northern fur seals: why have they declined? Aquatic Mammals 18:3-18.

Tyler, A. V. amd G. H. Kruse. 1996. Conceptual modeling of brood strength of red king crabs in the Bristol Bay region of the Bering Sea. High Latitude Crabs: Biology, Management, and Economics. Alaska Sea Grant College Program, AK-SG-96-02:512-543.

Tyler, A. V. and G. H. Kruse. 1997. Modeling workshop on year-class strength of Tanner crab, *Chionoecetes bairdi.* Regional Information Report No. 5J97-02, Alaska Department of Fish and Game Juneau.

Vaughan (unpublished data)

Venrick, E.L., J.A. McGowan, D.R. Cayan and T.L. Hayward. 1987. Climate and chlorophyll a: long-term trends in the central north Pacific Ocean. Science 238, 70-72.

Ware, D.M. 1991. Climate, predators and prey: behavior of a linked oscillating system, pp. 279-291, in *Long-term variability of pelagic fish populations and their environments*, (T. Kawasaki, S. Tanaka, Y. Toba and A. Tanaguchi, Eds), Pergamon Press, Tokyo, Japan.

Welschmeyer, N.A., S. Strom, R. Goerjcke, G. DiTullio, L. Belvin and W. Petersen. 1993. Primary production in the subarctic Pacific Ocean: Project SUPER. Prog. Oceanog. 32, 101-135.

Whittaker, L.M. and L.H. Horn. 1982. Atlas of northern hemisphere extratropical cyclonic activity, 1958-1977. Department of Meteorology, University of Wisconsin, Madison, W.I., 65 pp.

White, W.B. and N.E. Clark. 1975. Development of blocking ridge activity over the central north Pacific. J. Atmospheric. Sci. 32: 489-502.

Wilson, J. G.and J.E. Overland. 1987. Meterology, pp. 31-54, *in The Gulf of Alaska, Physical Environment and Biological Processes* (D.H. Hood and S.T. Zimmerman, Eds.), OAD, National Oceanic and Atmospheric Administration, Department of Commerce, US Printing Office, Washington, D.C.

Witherell, D. 1999. Status and trends of principal groundfish and shellfish stocks in the Alaska EEZ, 1999. North Pacific Fishery Management Council, Anchorage, AK.

Zheng, J. and G. H. Kruse. In press. Recruitment patterns of Alaskan crabs and relationships to decadal shifts in climate and physical oceanography. ICES Journal of Marine Science 56:00-00

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Appendix A. Description of the GEM Database

In June 1999, the Restoration Office began to develop a database of monitoring, survey and retrospective projects in the northern Gulf of Alaska. The purpose of the database is to identify major sources of data germane to the Gulf Ecosystem Monitoring (GEM) program.

As of October 1999, the database has information on 240 projects. Most of these projects were funded or conducted by government agencies. Major projects in this database are summarized in Appendix Table 1. The summary of projects is not exhaustive. There are two additional sources that may be consulted for a more extensive listing of projects, PICES web site, (http://pices.ios.bc.ca/data/weblist/weblist.htm), the Report of the Bering Sea Ecosystem Workshop (DOI-NOAA-ADF&G 1997), and Bering Sea and North Pacific Ocean Theme Page (www.pmel.noaa.gov/bering).

Each project in the database falls into one or more of the following categories: oceanography, fish and shellfish, marine mammals, seabirds, and contaminants. Each record includes a description of the project, the name and contact information for the principal investigator, the type of data gathered and analysis conducted, the locations of sampling stations, beginning and end dates, rough estimates of funding, and instructions for accessing the data generated by the project.

The database includes many projects that collect primary data. Examples include meteorological and oceanographic data from satellites or buoys. Other projects use this data or retrospective data to study an issue of interest to the Gulf Ecosystem Monitoring program. Still other projects compile data into catalogues or databases. Examples of such compilations are the [Pacific salmon and steelhead] Coded Wire Tag Database; the Pacific Seabird Monitoring Database, and the Beringian Seabird Catalogue.

In addition to refining entries on these projects, the Restoration Office is contacting private foundations and other nongovernmental organizations for information about projects they have sponsored or conducted.

Appendix Table 1. Selected Information Gathering Programs in the Gulf of Alaska. For more complete listing see the PICES web site, http://pices.ios.bc.ca/data/weblist/weblist.htm

Agency / Program	Data	Coverage in Gulf of Alaska
Oceanography		
GLOBEC / Gulf of Alaska Monitoring Program	Vertical CTD-chlorophyll-PAR profiles, ADCP, fluorescence, sea surface temperature and salinity, nutrients, chlorophyll pigments, oxygen isotope ratios and zooplankton. 1997-2000.	Seward Line Transect Cape Fairfield Line Transect
GLOBEC / Northeast Pacific Retrospective Studies	Analysis of retrospective data sets to document the link between climate and ocean variability and population variability.1998-2005.	Full coverage
NASA / Earth Observing System (EOS)	Sea surface temperature, phytoplankton, dissolved organic matter, wind fields, ocean surface. Since 1996.	Full satellite coverage.
NOAA, NASA / Advanced Very High Resolution Radiometer (AVHRR)	Sea surface temperature. 1985 - 1999.	Full satellite coverage.
NOAA / Moored Buoy Program	Wave height, dominant wave period, atmospheric pressure, pressure tendency, air temperature, and water temperature.	Gulf of Alaska 56N148W North PWS 60N146W South PWS 60N146W
NOAA / Coastal-Marine Automated Network (C-MAN)	Wind direction, speed, and gust; atmospheric pressure; air temperature. Since early 1980s.	Bligh Reef Light, Five Finger, Middle Rock and Potato Point

NOAA / Fisheries Oceanography Coordinated Investigations (FOCI)	Salinity, temperature, currents and fluorescence; nutrients, chlorophyll, microzooplankton; atmospheric variables; sediments. Since 1984.	Shelikof Strait
Fish and Shellfish		
IPHC / Assessment of Pacific Halibut Stock	Age, length, catch, effort, sex, sexual maturity of Pacific halibut. Research surveys since 1925.	Pacific halibut range
NOAA / Ocean Carrying Capacity / North Pacific Ocean Salmon Ecology	Ocean migrations, abundance and movement patterns, stock identification, genetics, growth, condition, diet. Research cruises since 1995.	Full coverage.
NOAA / Sablefish Longline Surveys	Annual surveys of sablefish. Also data on rockfish. Since 1979.	Full coverage.
ADFG / Salmon Escapement Counts	Enumeration of returning adult salmon. Data since early 1900's.	Salmon streams throughout the Gulf of Alaska region,
ADFG / Surveys	Age, weight, length, AWL, sex, abundance and distribution for herring, shellfish, and other species. Since 1980.	Full coverage.
ADFG / Fish Pathology Disease History Database	Disease histories of salmon, trout, herring, clams, and other fish and shellfish. Since 1973.	Full coverage.
ADFG / Coded Wire Tagging	Identification of a particular stock from a particular year. Since the early 1970's.	Primarily salmon hatcheries; a few wild fish programs
Marine Mammals and Seabirds		
NOAA / Marine Mammal Stock Assessments	Stock assessments for sea lions, harbor seals, various whales, and porpoises. Since 1995.	Full coverage.
DOI / Beringian Seabird Colony Catalog	Breeding population size, species composition and location. Data since the late 1800s.	Seabird colonies throughout Alaska

DOI / Alaska Seabird Inventory and Monitoring Plan	Population, nesting productivity and timing, prey use, growth rates, survival. Since 1970s.	10 different sites annually on the Alaska Maritime NWR
Contaminants		
NOAA / National Status and Trends Program / Mussel Watch Project	Contaminants in sediments and bivalve mollusks including PAHs and PCBs. Since 1986.	Cook Inlet, Kodiak Island, PWS
NOAA / National Status and Trends Program / National Benthic Surveillance	Chemical concentrations in the livers of bottom-dwelling fish. 1984-1993.	Prince William Sound
DOI / Alaska Marine Mammals Tissue Archiving Project	Heavy metals, PAH's, organic pollutants and other contaminants. Since 1987.	Full coverage.

Appendix B. Text of the Resolution of the Trustee Council

RESOLUTION

of the

Exxon Valdez Oil Spill Trustee Council

concerning the

Restoration Reserve and Long-term Restoration Needs

WHEREAS, in November 1994, following an extensive public process, the *Exxon Valdez* Oil Spill Trustee Council ("Trustee Council") adopted the *Restoration Plan* to guide a comprehensive and balanced program to restore resources and services injured by the oil spill;

WHEREAS, since that time the Trustee Council has used the *Restoration Plan* to guide development of the annual work plans as well as the acquisition and protection of large and small habitat parcels important to the long-term recovery of injured resources and services;

WHEREAS, the *Restoration Plan* identified a series of large parcel purchases and the Trustee Council has been successful in obtaining habitat protection agreements with willing-seller landowners to provide protection for approximately 635,000 acres;

WHEREAS, the *Restoration Plan* recognized that complete recovery from the oil spill would not occur for decades and that through long-term observation and, as needed, restoration actions, injured resources and services could be fully restored;

WHEREAS, the *Restoration Plan* specifically recognized establishment of the Restoration Reserve to provide a secure source of funding for restoration into the future beyond the last annual payment from the Exxon Corporation;

WHEREAS, the Trustee Council has sponsored an extensive public involvement process to provide opportunity for comment on possible future uses of the Restoration Reserve including public meetings in communities throughout the spill impact region and also in Anchorage, Fairbanks and Juneau;

WHEREAS, a large volume of public comment regarding the Restoration Reserve has been solicited and received urging a wide range of uses for remaining settlement funds including a strong showing of support for additional habitat protection efforts as well as research and other restoration efforts;

WHEREAS, numerous Native tribal members and other community residents from the spill area have indicated a strong interest in continued support for community-based efforts consistent with those that have been previously funded by the Trustee Council such as subsistence restoration, Traditional Ecological Knowledge, youth area watch, cooperative management, and local stewardship efforts;

WHEREAS, the Public Advisory Group (PAG) has reviewed and discussed long-term restoration needs and use of the Restoration Reserve at considerable length and the views of the PAG members have been communicated to the Trustee Council;

WHEREAS, upon consideration of the restoration mission as provided by the settlement and the *Restoration Plan*, past restoration program efforts and accomplishments, public comments received by the Trustee Council, the views of the Public Advisory Group members, and the most current information regarding the status of recovery of the resources and services injured by the oil spill, the Trustee Council has identified substantial and continuing long-term restoration needs;

WHEREAS, full recovery of many injured resources and services is not yet complete and long-term restoration, conservation and improved management of these resources and services will require a substantial on-going investment to improve our understanding of the biology and marine and coastal ecosystems that support the resources as well as the people of the spill region;

WHEREAS, prudent use of the natural resources of the spill area without unduly impacting their recovery requires increased knowledge of critical ecological information about the northern Gulf of Alaska that can only be provided through a long-term research and monitoring program;

WHEREAS, together with scientific research and monitoring, a continuing commitment to habitat protection and general restoration actions, where appropriate, will help ensure the full recovery of injured resources and services;

WHEREAS, consistent with the *Restoration Plan*, restoration needs identified by the Trustee Council require a long-term comprehensive and balanced approach that includes a complementary commitment to scientific research and monitoring; applied science to inform and improve the management of injured resources and services; continued general restoration activities where appropriate; support for community-based efforts to restore and enhance injured resources and services; and protection for additional key habitats;

WHEREAS, by October 2002, as a result of the past and anticipated future deposits into the Restoration Reserve, it is estimated that the principal and interest in the reserve, together with remaining unobligated settlement funds, will be approximately $170 million unless, prior to that time, on-going negotiations concerning the Karluk and Sturgeon rivers and adjacent lands or other potential habitat transactions result in habitat acquisition agreements that obligates some of these funds;

WHEREAS, absent such additional acquisition agreements, $170 million is the total of the funds estimated to be available to support long-term restoration based on projected investment returns allowable through the Court Registry under its existing authority and thus reasonably anticipated as available for restoration purposes by the

Trustee Council starting with FY 2003 ("estimated funds remaining on October 1, 2002"); and

WHEREAS, the limits of the existing investment authority of the Trustee Council have resulted in the loss of millions of dollars in potential earnings that would have been available to effectively address restoration needs in the future and support a comprehensive program that maintains its value over time, and it is necessary that the limits on the investment authority for the joint settlement funds be amended by Congress if we are to optimize our potential restoration program;

THEREFORE BE IT RESOLVED, that the Trustee Council has determined that recovery from the *Exxon Valdez* oil spill remains incomplete and there is need for establishing at this time a continuing long-term, comprehensive and balanced restoration program consistent with the *Restoration Plan*;

BE IT FURTHER RESOLVED, that funds in the Restoration Reserve and other remaining unobligated settlement funds available on October 1, 2002 (for expenditure starting in FY 2003) be allocated in the following manner consistent with the "Outline of Action Under Existing Authority" dated 3/1/99 attached to this resolution:

$55 million of the estimated funds remaining on October 1, 2002 and the associated earnings thereafter will be managed as a long-term funding source with a significant proportion of these funds to be used for small parcel habitat protection and it is recognized that any funding that may be authorized for purchase of lands along or adjacent to the Karluk or Sturgeon rivers or other potential habitat acquisitions would be made from within this allocation; and

the remaining balance of funds on October 1, 2002 will be managed so that the annual earnings, estimated at approximately 5% per year, will be used to fund annual work plans that include a combination of research, monitoring, and general restoration including those kinds of community-based restoration efforts consistent with efforts that have been previously funded by the Trustee Council, such as subsistence restoration, Traditional Ecological Knowledge, Youth Area Watch, cooperative management, and

local stewardship efforts, as well as local community participation in ongoing research efforts;

BE IT FURTHER RESOLVED, that the Restoration Office and the Chief Scientist, under the direction of the Executive Director, shall begin to develop a long-term research and monitoring program for the spill region that will inform and promote the full recovery and restoration, conservation and improved management of spill-area resources; and

BE IT FURTHER RESOLVED, that it is the intent of the Trustee Council that this long-term reserve for research, monitoring and general restoration be designed to ensure the conservation and protection of marine and coastal resources, ecosystems, and habitats in order to aid in the overall recovery of those resources injured by the *Exxon Valdez* oil spill and the long-term health and viability of the spill area marine environment;

BE IT FURTHER RESOLVED, that in developing a long-term restoration research, monitoring and general restoration program for the spill region, the Executive Director shall solicit the views of the Public Advisory Group, community facilitators, resource management agencies, researchers and other public interests as well as coordinate restoration program efforts with other marine research initiatives including the North Pacific Research Board;

BE IT FURTHER RESOLVED, that the Executive Director shall work with the Alaska Congressional delegation and appropriate State and federal agencies to obtain the necessary investment authority to increase the earnings on remaining settlement funds, so that the Trustee Council will be able to conduct an effective restoration program that maintains its value over time; and

BE IT FURTHER RESOLVED, that in developing long-term implementation options for consideration by the Trustee Council, the Executive Director shall:

investigate possible establishment of new or modified governance structures to implement long-term restoration efforts,

explore alternative methods to ensure meaningful public participation in restoration decisions, and

report back to the Trustee Council by September 1, 1999 regarding these efforts.

Adopted this 1st day of March, 1999, in Anchorage, Alaska.

DAVE GIBBONS	BRUCE M. BOTELHO
Trustee Representative	Attorney General
Alaska Region	State of Alaska
USDA Forest Service	

MARILYN HEIMAN	STEVEN PENNOYER
Special Assistant to the.	Director, Alaska Region

Secretary for Alaska

U.S. Department of the Interior

National Marine Fisheries Service

FRANK RUE

Commissioner

Alaska Department of

Fish and Game

MICHELE BROWN

Commissioner

Alaska Department of

Environmental Conservation

3/9/99 final

Appendix C. Bibliography of scientific publications

Exxon Valdez Oil Spill Trustee Council

645 G Street, Suite 401, Anchorage, AK 99501-3451 907/278-8012 fax: 907/276-7178

MEMORANDUM

TO: Trustee Council

THROUGH: Molly McCammon
Executive Director

FROM: Traci Cramer
Administrative Officer

DATE: October 21, 1999

RE: Financial Report as of September 30, 1999

Attached is the Statement of Revenue, Disbursements and Fees, and accompanying notes for the *Exxon Valdez* Joint Trust Fund for the settlement period ending September 30, 2002, as of September 30, 1999. The following is a summary of the information incorporated in the notes and contained on the statement.

Liquidity Account Balance	$49,930,337	
Plus: Other Adjustments (Note 5)	6,999,366	
Less: Restoration Reserve Adjustment (Note 6)	-47,666,664	
Liquidity Fund Balance		$9,263,039
Restoration Reserve Accrued Value	$47,773,587	
Plus: Liquidity Fund Adjustment (Note 6)	47,666,664	
Restoration Reserve Balance		$95,440,251
Joint Trust Fund as of August 31, 1999		**$104,703,290**
Plus: Future Exxon Payments (Note 1)	$140,000,000	
Less: Reimbursements (Note 3)	-7,500,000	
Less: Commitments (Note 7)	-80,042,567	
Uncommitted Balance		$52,457,433
Joint Trust Fund as of September 30, 2002		**$157,160,723**

Attachments

cc: Agency Liaisons
Bob Baldauf

NOTES TO THE STATEMENT OF REVENUE, DISBURSEMENTS AND FEES
FOR THE *EXXON VALDEZ* JOINT TRUST FUND
FOR THE SETTLEMENT PERIOD ENDING SEPTEMBER 30, 2002
As of September 30, 1999

1. Contributions - Pursuant to the agreement Exxon is to pay a total of $900,000,000.

Received to Date	$760,000,000
Future Payments	$140,000,000

2. Interest Income - In accordance with the MOA, the funds are deposited in the United States District Court, Court Registry Investment System (CRIS). All deposits with CRIS are maintained in United States government treasury securities with maturities of 100 days or less. Total earned since the last report is $259,606.

3. Reimbursement of Past Costs - Under the terms of the agreement, the United States and the State are reimbursed for expenses associated with the spill. The remaining reimbursements represent that amount due the State of Alaska.

4. Fees – CRIS charges a fee of 5% of earnings for cash management services. Total paid since the last report is $12,980.

5. Other Adjustments - Under terms of the Agreement, both interest earned on previous disbursements and prior years unobligated funding or lapse are deducted from future court requests. Unreported interest and lapse is summarized below.

	Interest	Lapse
United States	$610,563	$2,663,228
State of Alaska	$1,841,466	$1,884,109

6. Restoration Reserve/Liquidity Fund Adjustment – Includes the $12,000,000 transfer approved for Fiscal Year 1998, plus $1,225,000 in interest accrued since September 15, 1997, the $12,000,000 transfer approved for Fiscal Year 1999, plus $625,000 in interest accrued since September 15, 1998, and $12,000,000 transfer approved for Fiscal Year 2000, plus $25,000. The proceeds from the securities that matured on November 15, 1998 and were deposited to the Liquidity Fund have also been included. This includes $9,095,002, plus $447,298 in interest, less $34,724 in fees. Also included is $284,088 for fees that were assessed against the Restoration Reserve prematurely and deposited in the Liquidity Fund.

7. Commitments - Includes $2,711,000 for the Archaeological Repository and the following land payments.

Seller	Amount	Due
Afognak Joint Venture	$23,025,833	October 2000
Eyak	$18,000,000	September 2000 through 2002
Shuyak	$8,000,000	October 2000 through 2001
Shuyak	$11,805,734	October 2002
Koniag, Incorporated	$16,500,000	September 2002

STATEMENT OF REVENUE, DISBURSEMENT, AND FEES
EXXON VALDEZ OIL SPILL JOINT TRUST FUND
As of September 30, 1999

	1996	1997	1998	To Date 1999	Cumulative Total
REVENUE:					
Contributions: (Note 1)					
Contributions from Exxon Corporation	70,000,000	70,000,000	70,000,000	70,000,000	760,000,000
Less: Credit to Exxon Corporation for Deposit of Maturing Securities				9,095,002	(39,913,688) 9,095,002
Total Contributions	70,000,000	70,000,000	70,000,000	79,095,002	729,181,314
Interest Income: (Note 2)					
Exxon Corporation escrow account					831,233
Joint Trust Fund Account	3,963,073	2,971,070	2,673,585	2,124,921	23,149,316
Total Interest	3,963,073	2,971,070	2,673,585	2,124,921	23,980,549
Total Revenue	**73,963,073**	**72,971,070**	**72,673,585**	**81,219,923**	**753,161,863**
DISBURSEMENTS:					
Reimbursement of Past Costs: (Note 3)					
State of Alaska	3,291,446	5,000,000	3,750,000	3,750,000	99,059,288
United States	0	0	0	0	69,812,045
Total Reimbursements	3,291,446	5,000,000	3,750,000	3,750,000	168,871,333
Disbursements from Liquidity Account:					
State of Alaska	43,340,950	17,846,130	15,686,600	62,457,990	250,935,918
United States	31,047,824	60,101,802	39,468,461	32,676,850	232,749,633
Transfer to the Restoration Reserve	35,996,231	12,449,552			48,445,783
Total Disbursements	110,385,004	90,397,484	55,155,061	95,134,840	532,131,334
FEES:					
U.S. Court Fees - Liquidity Account (Note 4)	396,307	254,221	199,946	250,528	2,228,859
Total Disbursements and Fees	**114,072,758**	**95,651,705**	**59,105,007**	**99,135,368**	**703,231,526**
Increase (decrease) in Liquidity Account	**(40,109,685)**	**(22,680,635)**	**13,568,578**	**(17,915,445)**	**49,930,337**
Liquidity Account Balance, beginning balance	117,067,523	76,957,839	54,277,204	67,845,782	
Liquidity Account Balance, end of period	76,957,839	54,277,204	67,845,782	49,930,337	
Other Adjustments: (Note 5)					6,999,366
Restoration Reserve Adjustment: (Note 6)					(47,666,664)
Liquidity Fund Balance					9,263,039
Restoration Reserve Balance					95,440,251
Joint Trust Fund as of June 30, 1999					**104,703,289**
Future Exxon Payments (Note 1)					140,000,000
Reimbursements (Note 3)					(7,500,000)
Commitments: (Note 7)					(80,042,567)
Joint Trust Fund as of September 30, 2002					**157,160,722**

Statement 1

Statement of *Exxon Valdez* Settlement Funds
As of September 30, 1999

Beginning Balance of Settlement	900,000,000
Receipts:	
Interest Earned on Exxon Escrow Account	337,111
Net Interest Earned on Joint Trust Fund (Note 1)	20,920,457
Interest Earned on United States and State of Alaska Accounts	7,799,940
Total Interest	29,057,508
Disbursements:	
Reimbursements to United States and State of Alaska	168,871,333
Exxon clean up cost deduction	39,913,688
Joint Trust Fund deposits	561,141,214
Total Disbursements	769,926,235
Funds Available:	
Exxon Future Payments	140,000,000
Current Year Payment	0
Balance in Liquidity Account	49,930,337
Other Adjustments (Note 2)	6,999,366
Work Plan Commitments	0
Acquisition Commitments (Note 3)	(77,331,567)
Archaeological Repository (Note 4)	(2,711,000)
Alaska Sealife Center (Note 4)	0
Remaining Reimbursements	(7,500,000)
Restoration Reserve Accrued Value	47,773,587
Joint Trust Fund Balance as of September 30, 2002	157,160,722

Note 1: Gross interest earned less District Court registry fees
Note 2: Adjustment for unreported interest earned and lapse
Note 3: Includes both current year and future year payments
Note 4: Other Authorizations

Footnote:

Statement 2

Cash Flow Statement
***Exxon Valdez* Liquidity Account**
As of September 30, 1999

Receipts:		
Exxon payments		
December 1991	36,837,111	
December 1992	56,586,312	
September 1993	68,382,835	
September 1994	58,728,400	
September 1995	67,303,000	
September 1996	66,708,554	
September 1997	65,000,000	
September 1998	66,250,000	
Deposit of Maturing Securities	9,095,002	
September 1999	66,250,000	
Total Deposits	561,141,214	561,141,214
Interest Earned	23,149,316	
Total Interest	23,149,316	23,149,316
Total Receipts		584,290,530
Disbursements:		
Court Requests		
Fiscal Year 1992	12,879,700	
Fiscal Year 1993	27,634,994	
Fiscal Year 1994	50,554,653	
Fiscal Year 1995	89,989,597	
Fiscal Year 1996	74,388,774	
Fiscal Year 1997	77,947,932	
Fiscal Year 1998	55,155,061	
Fiscal Year 1999	95,134,840	
Total Requests	483,685,551	483,685,551
District Court Fees	2,228,859	2,228,859
Transfer to the Restoration Reserve		48,445,783
Total Disbursements		534,360,193
Balance in Joint Trust Fund		49,930,337

Footnote:
A total of $48,445,783 has been disbursed from the Liquidity Account to the Restoration Reserve. Of the total, $48,445,663 was used to purchase laddered securities. The difference of $120 represents costs paid to the Federal Reserve Bank. An additional $10 Federal Reserve Bank fees was assessed the Restoration Reserve on 11/17/97 for costs associated with the reinvestment of maturing securities.

Exxon Valdez Restoration Reserve								
Unallocated Deposits/Unallocated Proceeds								
As of September 30, 1999								
		Principal	Adjustment	Earnings	Total			
Fiscal Year 1998 Deposit		12,000,000		1,225,000	13,225,000			
November 15, 1998 Par Value		9,095,002	284,088	412,574	9,791,664			
Fiscal Year 1999 Deposit		12,000,000		625,000	12,625,000			
Fiscal Year 2000 Deposit		12,000,000		25,000	12,025,000			
Total Included in Liquidity Account		45,095,002	284,088	2,287,574	47,666,664			
Reserve Portfolio Accrued Value					47,773,587			
Total Accrued Value of the Restoration Reserve					95,440,251			
Interest/Fees associated with the 1998 Security:								
				Reserve	Liquidity		Reserve	Liquidity
Period	Reserve	Liquidity	Interest	Interest	Interest	Fees	Fees	Fees
11/19/98 - 11/26/98	9,095,002	47,795,857	40,418	9,499	30,919	4,273	1,004	3,269
11/27/98 - 12/02/98	9,103,496	47,883,317	37,460	8,794	28,666	4,161	977	3,184
12/03/98 - 12/09/98	9,111,313	47,866,716	33,399	7,852	25,547	3,711	872	2,839
12/10/98 - 12/16/98	9,118,292	48,059,641	26,436	6,190	20,246	2,937	688	2,250
adjustment	284,088							
12/17/98 - 12/23/98	9,407,883	48,089,227	29,586	7,196	22,390	3,287	800	2,488
12/24/98 - 12/30/98	9,414,279	48,117,048	27,821	6,767	21,054	3,091	752	2,339
12/31/98 - 1/06/99	9,420,295	48,148,297	31,249	7,601	23,648	3,472	845	2,628
1/07/99 - 1/13/99	9,427,051	35,172,657	24,361	8,920	15,441	2,707	991	1,716
7/15/99 - 07/21/99	9,688,863	33,672,523	28,767	11,621	17,146	1,563	631	932
7/22/99 - 07/28/99	9,699,853	33,701,133	29,594	11,960	17,634	1,506	609	897
7/29/99 - 08/04/99	9,711,204	33,728,062	26,929	10,889	16,040	1,417	573	844
8/05/99 - 08/11/99	9,721,520	33,754,348	26,286	10,633	15,653	1,383	560	824
8/12/99 - 08/18/99	9,731,593	33,776,166	21,818	8,830	12,988	1,148	465	684
8/19/99 - 08/25/99	9,739,959	33,800,834	24,668	9,986	14,682	1,298	526	773
8/26/99 - 09/01/99	9,749,419	33,828,252	27,418	11,101	16,317	1,443	584	859
09/02/99 - 09/08/99	9,759,936	100,157,440	79,189	8,550	70,639	4,168	450	3,718
09/09/99 - 09/15/99	9,768,036	90,413,787	66,646	8,072	58,574	3,508	425	3,083
09/16/99 - 09/22/99	9,775,683	90,476,557	62,770	7,604	55,167	3,304	400	2,903
09/23/99 - 09/29/99	9,782,887	49,930,337	38,020	9,265	28,756	2,001	488	1,513
Total				447,298	926,255		34,724	71,094

Schedule of Payments from Exxon As of September 30, 1999								
Disbursements:	September 93	September 94	September 95	September 96	September 97	September 98	September 99	Total
Reimbursements:								
United States								
FFY92	0							24,726,280
FFY93	11,617,165							36,117,165
FFY94	0	6,271,600						6,271,600
FFY95	0		2,697,000					2,697,000
Total United States	11,617,165	6,271,600	2,697,000	0	0	0	0	69,812,045
State of Alaska								
General Fund:								
FFY92	0							25,313,756
FFY93	0							16,685,133
FFY94	14,762,703							14,762,703
FFY95	0	0						0
Mitigation Account:								
FFY92	0							3,954,086
FFY93	0							12,314,867
FFY94	5,237,297	5,000,000						10,237,297
FFY95 (Prevention Account)	0		0					0
FFY96 (Prevention Account)				3,291,446				3,291,446
FFY97 (Prevention Account)					5,000,000			5,000,000
FFY98 (Prevention Account)						3,750,000		3,750,000
FFY99 (Prevention Account)							3,750,000	3,750,000
Total State of Alaska	20,000,000	5,000,000	0	3,291,446	5,000,000	3,750,000	3,750,000	99,059,288
Total Reimbursements	31,617,165	11,271,600	2,697,000	3,291,446	5,000,000	3,750,000	3,750,000	168,871,333

Deposits to Joint Trust Fund								
FFY92	0							36,837,111
FFY93	68,382,835							124,969,147
FFY94	0							0
FFY95	0	58,728,400	67,303,000					126,031,400
FFY96				66,708,554				66,708,554
FFY97					65,000,000			65,000,000
FFY98						66,250,000	66,250,000	132,500,000
Total Deposits to Joint Trust Fund	68,382,835	58,728,400	67,303,000	66,708,554	65,000,000	66,250,000	66,250,000	552,046,212
Exxon clean up cost deduction	0	0	0	0	0	0	0	39,913,688
Total Payments	100,000,000	70,000,000	70,000,000	70,000,000	70,000,000	70,000,000	70,000,000	690,831,233
Remaining Exxon payments to be made:								
September 1994								
September 1995								
September 1996								
September 1997								
September 1998								
September 1999								
September 2000		70,000,000						
September 2001		70,000,000						
		140,000,000						

The December 1991 payment includes interest accrued on the escrow account. The actual disbursements without interest was $24.5 million to the United States, $29 million to the State of Alaska and $36.5 million to the Joint Trust Fund. The total interest earned on the escrow account was $831,233 which was disbursed proportionately. This included $226,280 to the United States, $267,842 to the State of Alaska and $337,111 to the Joint Trust Fund.

The September 1994 reimbursement to the United States included an over-payment of $80,700 to NOAA. This over-payment is a direct result of final costs for damage assessment activities being lower than what was previously estimated. The funds were returned to the Joint Account by reducing the amount transferred to the United States in Court Request number 15.

Schedule of Disbursements
***Exxon Valdez* Liquidity Account**
As of September 30, 1999

	United States	State of Alaska	Court Request Total	Court Fees	Disbursements Total
Total Fiscal Year 1992	6,320,500	6,559,200	12,879,700	23,000	12,902,700
Total Fiscal Year 1993	9,105,881	18,529,113	27,634,994	154,000	27,788,994
Total Fiscal Year 1994	6,008,387	44,546,266	50,554,653	364,000	50,918,653
Total Fiscal Year 1995	48,019,928	41,969,669	89,989,597	586,857	90,576,454
Court Request 17		3,294,667	3,294,667		
Court Request 18	8,000,000		8,000,000		
Court Request 19	3,222,224	1,968,898	5,191,122		
Restoration Reserve Transfer			35,996,231		
Court Request 20		8,000,000	8,000,000		
Court Request 21	1,007,000	5,520,500	6,527,500		
Court Request 22	18,818,600	24,556,885	43,375,485		
Total Fiscal Year 1996	31,047,824	43,340,950	110,385,004	396,307	110,781,312
Court Request 23	2,613,500	0	2,613,500		
Court Request 24	176,500	3,075,625	3,252,125		
Court Request 25	785,859	442,833	1,228,692		
Court Request 26	24,154,000	530,000	24,684,000		
Court Request 27	324,700	1,470,900	1,795,600		
Restoration Reserve Transfer			12,449,552		
Court Request 28	0	2,627,000	2,627,000		
Court Request 29	5,919,169	5,699,772	11,618,941		
Court Request 30	26,128,074	4,000,000	30,128,074		
Total Fiscal Year 1997	60,101,802	17,846,130	90,397,484	254,221	90,651,705
Court Request 31	445,200	643,800	1,089,000		
Court Request 32	464,300	996,100	1,460,400		
Court Request 33	14,150,000		14,150,000		
Court Request 34	4,000,000		4,000,000		
Court Request 35	20,408,961	14,046,700	34,455,661		
Court Request 35 Correction					
Total Fiscal Year 1998	39,468,461	15,686,600	55,155,061	199,946	55,355,007
Court Request 35 Correctio	-300		-300		
Court Request 36		29,520,000	29,520,000		
Court Request 37	13,000,000		13,000,000		
Court Request 38	451,100	1,613,200	2,064,300		
Court Request 39	156,300		156,300		
98180 Revenue Adjustment	21,400	-21,400	0		
Court Request 40	4,951,500	4,858,800	9,810,300		
Court Request 41	14,096,850	26,487,390	40,584,240		
Total Fiscal Year 1999	32,676,850	62,457,990	95,134,840	250,528	95,385,368
Total	**232,749,633**	**250,935,918**	**532,131,334**	**2,228,859**	**534,360,193**

Exxon Valdez Liquidity Account
Interest Earned/District Court Registry Fees
As of September 30, 1999

	FFY 1993	FFY 1994	FFY 1995	FFY 1996	FFY 1997	FFY 1998	FFY 1999	Total
Earnings Deposits	31,124	33,476	55,809					138,092
Earnings Allocated:								
1991								28,704
1992	553,697							1,080,309
1993	639,180	1,461,736						2,100,915
1994		1,876,788	1,402,938					3,279,726
1995			3,661,063	1,202,209				4,863,272
1996				2,364,556	810,894			3,175,451
1997					1,905,955	653,461		2,559,416
1998						1,820,177	695,964	2,516,141
1999							1,178,429	1,178,429
Total	1,192,876	3,338,524	5,064,001	3,566,766	2,716,849	2,473,639	1,874,393	20,782,365
Total Earnings	1,224,000	3,372,000	5,119,809	3,566,766	2,716,849	2,473,639	1,874,393	20,920,457
Registry Fees:								
1991								3,189
1992	100,223							120,034
1993	53,777	179,658						233,435
1994		184,342	180,072					364,414
1995			406,785	133,579				540,364
1996				262,729	90,099			352,828
1997					164,121	52,983		217,105
1998						146,962	166,171	313,134
1999							84,357	84,357
Total	154,000	364,000	586,857	396,307	254,221	199,946	250,528	2,228,859
Gross Earnings	1,378,000	3,736,000	5,706,667	3,963,073	2,971,070	2,673,585	2,124,921	23,149,316

Schedule of I	st Earned on United States and State of A		a Accounts
As of September 30, 1999			
	State of Alaska EVOSS Account	United States NRDA& R	Total
January 1996	134,300		134,300
February 1996	122,348		122,348
March 1996	132,469	64,381	196,850
April 1996	126,550		126,550
May 1996	136,732		136,732
June 1996	145,501	73,267	218,768
July 1996	128,195		128,195
August 1996	106,079		106,079
September 1996	110,890	29,042	139,933
October 1996	181,598		181,598
November 1996	162,806		162,806
December 1996	153,991	71,093	225,084
January 1997	147,934		147,934
February 1997	125,137		125,137
March 1997	131,457	24,374	155,831
April 1997	122,111		122,111
May 1997	114,954		114,954
June 1997	99,811	368,523	468,334
July 1997	221,906		221,906
August 1997	36,898		36,898
September 1997	159,695	38,289	197,984
October 1997	119,195		119,195
November 1997	49,120		49,120
December 1997	92,204	130,183	222,387
January 1998	120,038		120,038
February 1998	29,888		29,888
March 1998	59,202	76,715	135,917
April 1998	55,222		55,222
May 1998	59,406		59,406
June 1998	50,136	74,613	124,749
July 1998	37,215		37,215
August 1998	78,178		78,178
September 1998	157,591	(44,921)	112,670
October 1998	61,084		61,084
November 1998	(16,484)		(16,484)
December 1998	74,639	87,633	162,272
January 1999	80,222		80,222
February 1999	(78,738)		(78,738)
March 1999	101,632	172,530	274,162
April 1999	58,096		58,096
May 1999	(12,282)		(12,282)
June 1999	37,975	94,821	132,797
July 1999	28,764		28,764
August 1999	37,133		37,133
September 1999	147,627		147,627
Total	6,198,513	1,601,428	7,799,940

NOTE: The $117,178 NRDA&R interest figure is cummulative.

Interest was earned for the period July 1992 through December 1995, but the specific amounts have been hidden to allow the spreadsheet to print on one page.

Schedule of Interest Adjustments to the Court Requests
As of September 30, 1999

Court Request	United States	State of Alaska	Total	Comments
Adjustment	2		2	Per Robert Baldauf 12/6/96
Court Request 2	39,871	80,775	120,646	
Court Request 3	3,648	35,012	38,660	
Total Fiscal Year 1993	43,521	115,787	159,308	
Court Request 5	51,231	64,944	116,175	
Court Request 6	22,427	180,536	202,963	
Court Request 7		58,554	58,554	
Total Fiscal Year 1994	73,658	304,034	377,692	
Court Request 8	34,621	52,823	87,444	
Court Request 9		117,838	117,838	
Court Request 10	37,618	44,291	81,909	
Court Request 13	3,849	320,837	324,686	
Court Request 15	63,226	449,634	512,860	
Total Fiscal Year 1995	139,314	985,423	1,124,737	
Court Request 19	48,676	262,202	310,878	
Notice 1	37,100	300	37,400	
Notice 2	26,600	289,400	316,000	
Court Request 22	109,666	934,433	1,044,099	
Total Fiscal Year 1996	222,042	1,486,335	1,708,377	
Court Request 25	29,041	398,567	427,608	
Notice 3		275,700	275,700	
Court Request 29	463,989	782,501	1,246,490	
Total Fiscal Year 1997	493,030	1,456,768	1,949,798	
Notice 4	19,000	8,700	27,700	
Court Request 35	300		300	
Total Fiscal Year 1998	19,300	8,700	28,000	
Adjustments to Date	990,865	4,357,047	5,347,912	
Total Interest Reporte	1,601,428	6,198,513	7,799,940	linked to the Int Acct spreadsheet
Unallocated Interest	**610,563**	**1,841,466**	**2,452,029**	

Footnote: The Total Interest Reported is linked to the INT Acct spreadsheet

Schedule of Lapse Adjustments to the Court Requests
As of September 30, 1999

Court Request	United States	State of Alaska	Total
Court Request 6	3,106,555	3,661,600	6,768,155
Total Fiscal Year 1994	3,106,555	3,661,600	6,768,155
Court Request 15	220,858	2,376,950	2,597,808
Total Fiscal Year 1995	220,858	2,376,950	2,597,808
Court Request 22	1,165,334	2,500,448	3,665,782
Total Fiscal Year 1996	1,165,334	2,500,448	3,665,782
Court Request 29	1,102,442	3,549,927	4,652,369
Total Fiscal Year 1997	1,102,442	3,549,927	4,652,369
Total Adjustments	**5,595,189**	**12,088,925**	**17,684,114**

Schedule of Work Plan Authorizations and Other Authorizations

	FFY 92	FFY 93	FFY 94	FFY 97	FFY 98	FFY 99	FFY 00	Total
Work Plan Authorizations								
United States:								
June 15, 1992	6,320,500	0	0					
January 25, 1993	0	3,113,900	0					
January 25, 1993	0	6,035,500	0					
November 10, 1993	0	0	0					
November 30, 1993	0	0	2,567,300					
June 1994			4,536,800					
June 1994			84,500					
July 1994			1,500,000					
Carry Forward Authorization								
August 1994								
November 1994								
December 1994								
March 1995								
August 1995								
December 1995								
January 1996								
April 1996								
May 1996								
June 1996								
August 1996				7,923,700				
December 1996				310,900				
February 1997				0				
May 1997				0				
August 1997				85,000	7,263,600			
December 1997					445,200			
June 1998					(39,200)			
August 1998						5,397,700		
December 1998						451,100		
May 1999						91,700		
August 1999							4,859,800	
Total	6,320,500	9,149,400	8,688,600	8,319,600	7,669,600	5,940,500	4,859,800	68,431,300

Schedule of Work Plan Auth_____ons and Other Authorizations

	FFY 92	FFY 93	FFY 94	FFY 97	FFY 98	FFY 99	FFY 00	Total
Work Plan Authorizations								
State of Alaska								
June 15, 1992	6,559,200	0	0					
January 25, 1993	0	3,574,000	0					
January 25, 1993	0	7,570,900	0					
November 30, 1993	0	0	4,454,400					
June 1994			12,391,700					
June 1994			215,800					
July 1994			0					
Carry Forward Authorization								
August 1994								
November 1994								
December 1994								
March 1995								
August 1995								
December 1995								
April 1996								
May 1996								
June 1996								
August 1996				11,606,300				
December 1996				310,400				
February 1997				275,700				
May 1997				0				
August 1997				(85,000)	9,393,200			
December 1997					643,800			
June 1998					66,900			
August 1998						8,131,400		
December 1998						1,613,200		
January 1999						12,700		
May 1999						(25,700)		
August 1999							4,871,800	
September 1999							40,400	
Total	6,559,200	11,144,900	17,061,900	12,107,400	10,103,900	9,731,600	4,912,200	104,531,800

Schedule of Work Plan Auth...ions and Other Authorizations

	FFY 92	FFY 93	FFY 94	FFY 97	FFY 98	FFY 99	FFY 00	Total
Other Authorizations								
United States:								
Orca Narrows (6/94)			2,000,000					3,450,000
Eyak Limited Conservation Easement								200,000
Eyak						27,096,850		27,096,850
Kodiak National Wildlife Refuge (3/95, 9/95 AKI)				7,500,000				36,000,000
Kodiak National Wildlife Refuge (3/95, 9/95 Old Harbor)								11,250,000
Koniag				4,500,000				17,000,000
Small Parcels				3,740,200	4,464,300			8,583,500
Chenega Land Acquisition				24,000,000				24,000,000
Chenega-Area Oiling Reduction				157,400	182,000			343,000
Tatitlek					14,150,000			14,150,000
English Bay				14,128,074				14,128,074
Total			2,000,000	54,025,674	18,796,300	27,096,850	0	156,201,424
State of Alaska:								
Kachemak Bay State Park (1/95)		7,500,000						7,500,000
Alutiiq Repository (11/93)		1,500,000						1,500,000
Seal Bay (11/93,11/94,11/95,11/96)			29,950,000	3,075,625				39,549,334
Shuyak (3/96, 10/96 - 10/02				2,194,266	4,000,000	4,000,000		18,194,266
Afognak Joint Ventures (10/98)						50,247,509		50,247,509
Small Parcels				3,738,000	996,100	770,000		10,524,600
Alaska SeaLife Center								24,956,000
Chenega-Area Oiling Reduction				1,732,000				1,732,000
Alaska SeaLife Center Fish Pass				545,600				545,600
Alaska SeaLife Center Equipment				724,000				724,000
Sound Waste Management Plan				1,167,900		1,857,100		3,025,000
Archaeological Repository							89,000	89,000
Total		9,000,000	29,950,000	13,177,391	4,996,100	56,874,609	0	158,498,309
Total Other Authorizations	0	9,000,000	31,950,000	67,203,065	23,792,400	83,971,459	0	314,699,733
Total Work Plan Authorizations	12,879,700	20,294,300	25,750,500	20,427,000	17,773,500	15,672,100	9,772,000	172,963,100
Restoration Reserve				12,449,552	0	0	0	48,445,783
Total Authorized	12,879,700	29,294,300	57,700,500	100,079,617	41,565,900	99,643,559	9,772,000	536,108,616

Exxon Valdez Restoration Reserve
For the period ending September 30, 1999

	Matured	Purchase Date	Maturity Date	Unit Cost	Bond Yield	Holding Period	Par Value	Purchase Price	Projected Interest	Daily Accrual	Interest Accrued	Fees Accrued
A1	YES	02/15/96	11/15/97	92.014982	4.820%	639	6,520,000	5,999,376.83	520,623.17	814.75	520,623.17	52,062.32
A2	YES	02/15/96	11/15/98	87.582363	4.885%	1004	6,850,000	5,999,391.87	850,608.13	847.22	850,608.13	85,060.81
A3		**02/15/96**	**11/15/99**	**82.953778**	**5.050%**	**1369**	**7,232,000**	**5,999,217.22**	**1,232,782.78**	**900.50**	**1,192,260.34**	**111,616.82**
A4		02/15/96	11/15/00	78.462785	5.175%	1735	7,646,000	5,999,264.54	1,646,735.46	949.13	1,256,644.24	117,644.30
A5		02/15/96	11/15/01	73.993112	5.310%	2100	8,108,000	5,999,361.52	2,108,638.48	1,004.11	1,329,446.36	124,459.88
A6		02/15/96	11/15/02	69.640845	5.435%	2465	8,615,000	5,999,558.80	2,615,441.20	1,061.03	1,404,804.93	131,514.78
B1	YES	06/19/97	11/15/98	92.238000	5.835%	514	2,245,000	2,070,743.10	174,256.90	339.02	174,256.90	17,425
B2		**06/19/97**	**11/15/99**	**86.555000**	**6.095%**	**879**	**2,397,000**	**2,074,723.35**	**322,276.65**	**366.64**	**305,777.85**	**27,479.68**
B3		06/19/97	11/15/00	81.242000	6.195%	1245	2,554,000	2,074,920.68	479,079.32	384.80	320,925.42	28,840.96
B4		06/19/97	11/15/01	76.141000	6.285%	1610	2,725,000	2,074,842.25	650,157.75	403.82	336,789.79	30,266.66
B5		06/19/97	11/15/02	71.628000	6.270%	1975	2,896,000	2,074,346.88	821,653.12	416.03	346,966.43	31,181.22
B6		06/19/97	11/15/03	66.930000	6.360%	2340	3,106,000	2,079,915.79	1,026,084.21	438.50	365,706.94	32,865.39
C1		11/17/97	11/15/04	66.629000	5.890%	2555	9,281,000	6,183,837.49	3,097,162.51	1,212.20	829,142.53	72,671.19
											9,233,953.01	863,089.69

Status:

A1 The proceeds were reinvested 11/17/97.

A2 The proceeds were deposited into the Liquidity Account.

B1 The proceeds were deposited into the Liquidity Account.

Deposits:		FRB
FY 96 (Securities A1-A6)	35,996,170.78	60.00
FY 97 (Securities B1-B6)	12,449,492.05	60.00
FY 98		10.00
Principal	48,445,662.83	
Gross Earnings	9,233,953.01	
Less: Unpaid Fees	811,027.37	
Less: 1998 Securities (Par)	9,095,001.76	
Total	47,773,586.71	
Pending Deposits	47,666,664.19	
Balance	95,440,250.90	130.00
Prior Period	83,074,769.81	
Net Change	12,365,481.09	

	Fees to Date	Unpaid Fees
	52,062.32	811,027.37

	Principal	Adjustment	Interest	Total
FY 1998 Deposit	12,000,000	0	1,225,000	13,225,000
1998 Par Value	9,095,002	284,088	412,574	9,791,664
FY 1999 Deposit	12,000,000	0	625,000	12,625,000
FY 2000 Deposit	12,000,000	0	25,000	12,025,000
Liquidity Account Total	45,095,002	284,088	2,287,574	47,666,664
Fiscal Year 1998 Contribution				
Period Ending	Principal	Interest @ 5%	Total Transfer	
September-97	12,000,000	25,000	12,025,000	
October-97	12,000,000	75,000	12,075,000	
November-97	12,000,000	125,000	12,125,000	
December-97	12,000,000	175,000	12,175,000	
October-98	12,000,000	675,000	12,675,000	
November-98	12,000,000	725,000	12,725,000	
December-98	12,000,000	775,000	12,775,000	
January-99	12,000,000	825,000	12,825,000	
February-99	12,000,000	875,000	12,875,000	
March-99	12,000,000	925,000	12,925,000	
April-99	12,000,000	975,000	12,975,000	
May-99	12,000,000	1,025,000	13,025,000	
June-99	12,000,000	1,075,000	13,075,000	
July-99	12,000,000	1,125,000	13,125,000	
August-99	12,000,000	1,175,000	13,175,000	
September-99	12,000,000	1,225,000	13,225,000	
October-99	12,000,000	1,275,000	13,275,000	
November-99	12,000,000	1,325,000	13,325,000	
December-99	12,000,000	1,375,000	13,375,000	
Fiscal Year 1999 Contribution				
Period Ending	Principal	Interest @ 5%	Total Transfer	
September-98	12,000,000	25,000	12,025,000	
October-98	12,000,000	75,000	12,075,000	
November-98	12,000,000	125,000	12,125,000	
December-98	12,000,000	175,000	12,175,000	
January-99	12,000,000	225,000	12,225,000	
February-99	12,000,000	275,000	12,275,000	
March-99	12,000,000	325,000	12,325,000	
April-99	12,000,000	375,000	12,375,000	
May-99	12,000,000	425,000	12,425,000	
June-99	12,000,000	475,000	12,475,000	
July-99	12,000,000	525,000	12,525,000	
August-99	12,000,000	575,000	12,575,000	
September-99	12,000,000	625,000	12,625,000	
October-99	12,000,000	675,000	12,675,000	
November-99	12,000,000	725,000	12,725,000	
December-99	12,000,000	775,000	12,775,000	

Fiscal Year 2000 Contribution				
Period Ending	Principal	Interest @ 5%	Total Transfer	
September-99	12,000,000	25,000	12,025,000	
October-99	12,000,000	75,000	12,075,000	
November-99	12,000,000	125,000	12,125,000	
December-99	12,000,001	125,000	12,125,001	

Exxon Valdez Oil Spill Trustee Council

645 G Street, Suite 401, Anchorage, AK 99501-3451 907/278-8012 fax:907/276-7178

MEMORANDUM

TO: *Exxon Valdez* Oil Spill Trustee Council

FROM: Molly McCammon
Executive Director

RE: Future of Small Parcel Program

DATE: October 15, 1999

On March 1, 1999 the Trustee Council adopted a resolution regarding the Restoration Reserve. It provided, in part, that:

> $55 million of the estimated funds remaining on October 1, 2002 and the associated earnings thereafter will be managed as a long-term funding source [for habitat protection] with a significant proportion of these funds to be used for small parcel habitat protection and it is recognized that any funding that may be authorized for purchase of lands along or adjacent to the Karluk or Sturgeon rivers or other potential habitat acquisitions [beyond current commitments] would be made from within this allocation.

Materials accompanying the resolution identified three issues that require further consideration...

(1) priority, criteria, and decision-making process for specific parcel selection,
(2) extent of public involvement in future program, and
(3) possible role of non-governmental organization to implement program after October 2002

... and stated that administrative costs will be allocated between the research/monitoring/general restoration program and habitat protection program in proportion to program area costs.

A draft discussion paper that begins to address the issues noted above is attached. It also describes some potential small parcel acquisition opportunities.

PROCESS FOR PARCEL SELECTION, INCLUDING PUBLIC INVOLVEMENT AND POSSIBLE ROLE OF NON-GOVERNMENTAL ORGANIZATION

Summary of Current Process

Program Administration

Parcel nominations are submitted to the Council and forwarded to a multi-agency review team for evaluation and ranking. Current team members are Catherine Berg/DOI-USFWS, Ken Holbrook/USFS, Mark Kuwada/ADFG, and Art Weiner/ADNR. Appraisals and negotiations are authorized by the Council on a parcel-by-parcel basis. Appraisals are conducted by the relevant resource agency and reviewed by both state and federal review appraisers. Purchase negotiations are conducted by agency land management staff and state and federal attorneys. Purchase offers can be made only with the approval of the Council. The costs of these administrative activities are funded by the Council through Project /126. This project also includes funds for the administration of the large parcel program, and does not segregate costs between the two programs. The 00126 (FY 2000) budget is $373,500.

Parcel Nomination

Broad public notices (ads in nine newspapers and an article in the Trustee Council newsletter), issued in May 1994 (Phase 1) and again in March 1995 (Phase 2), resulted in nomination of 262 parcels. There has been no outreach effort since 1995 and a "soft moratorium" has been in place (the focus is on nominations submitted under phases 1 and 2, but further nominations continue to be accepted). Approximately 120 additional parcels have been nominated since the completion of Phase 2 in 1995.

Parcel Evaluation and Ranking

Threshold criteria

Designed to eliminate parcels that would not contribute to restoration objectives or would otherwise be inappropriate:

- Willing seller
- Seller acknowledges purchase price must be at or below fair market value
- Within spill area
- Parcel linked to restoration of injured resource or service
- Parcel can be incorporated into public land management systems in a manner that will facilitate restoration objectives (in practice, this has come to mean that a Trustee agency must be willing to sponsor the parcel)

IN ADDITION, although not a threshold criteria, small parcels have been limited to under 1,000 acres with the following exceptions: Salamatof 1,377 acres, Moose River 1,243 acres, and Termination Point 1,028 acres.

Evaluation criteria and formula for those parcels that meet threshold criteria

LINKAGE

4 questions related to link to key habitats of an injured resource (i.e., areas used for spawning, overwintering, concentrated nesting, haulouts, seabird colonies, dense seagrass beds, mussel beds, etc. but not areas used for feeding, migration corridors, or dispersed or infrequent human use) or service (i.e., areas with high use levels or strategic value to services; for example, the only public access or the only or best camping, subsistence harvest, or sport fishing site but not scenic viewsheds). Uniqueness (in relation to off-parcel habitat), connectedness (to other habitats in the greater ecosystem), and quality (high levels of production, diversity, etc.) are considered.

PROTECTION

4 questions related to potential threats to injured resources/services (i.e., the adverse effects of development on the parcel to habitat on the parcel as well as to habitat on adjacent lands) beyond the protection that can be provided by the owner and existing laws and regulations.

MANAGEMENT

2 questions related to improving ability to manage public resources to promote recovery (i.e., opportunities to enhance injured resources/services and to provide access).

	Example	
1st	Within each of the three categories (linkage, protection, management), answer each question yes or no	
2nd	Sum the yes's in each category	
3rd	Add 1 to each category's sum to get a new sum for each category	
4th	Multiply the three new sums by each other to get a parcel score	
Steps 1-3:	*Linkage*	*(2 yes & 2 no = 2) + 1 = 3*
	Protection	*(1 yes & 3 no = 1) + 1 = 2*
	Management	*(0 yes & 2 no = 0) + 1 = 1*
Step 4:	*3 x 2 x 1 = 6 (parcel score)*	

Parcels are ranked HIGH (40 or more points), MODERATE (20-39 points), or LOW (19 or less points). Parcels ranked HIGH or MODERATE are considered suitable for purchase. In addition, parcels ranked LOW, but which are identified as otherwise having unique or outstanding restoration value for injured resources or services, can be designated by the Council as "parcels meriting special consideration" and suitable for purchase. The

Council adopted this modification to the evaluation process in 1995, realizing that the process does not always recognize all of the restoration values associated with certain parcels.

Appraisal and Negotiation

A standardized 12-step process for appraisal, appraisal review, and appraisal approval was established in June 1994. Prior to the soft moratorium being in place, all parcels ranked HIGH or MODERATE (scores of 20 and above) were automatically appraised without further Council action. Since the soft moratorium has been in effect, each appraisal must be specifically authorized by the Council. Appraisals are conducted by the relevant resource agency and reviewed by both state and federal review appraisers. This step also includes purchase negotiations, title searches, and surveys.

Offer to Purchase / Reciprocal Conservation Easement

The Council must approve each offer to purchase. Considerations in approving an offer include the parcel's restoration benefits, terms and conditions of the landowner, public comment, the management strategy proposed for the parcel, and the availability of funds. Parcels are purchased by one of the Trustee agencies, using funds allocated by the Council. Following the Council's approval of an offer, the managing agency develops a purchase agreement with the seller, then proceeds to acquire title to the parcel and incorporate it into public management. Each purchase agreement includes a "reciprocal conservation easement," under which the government not purchasing the land (i.e., either state or federal) is provided the right to enforce certain restrictions on the use of the land. These easements are designed to ensure that the lands purchased are not used for purposes inconsistent with restoration.

Public Comment

The Council takes all action on small parcels at public meetings, which are publicly noticed with an announced agenda. Public comment is invited at every Council meeting and the PAG is briefed on the status of small parcels at each of its meetings. However, a formal notice of public review and a formal review period is not a step in the small parcel process. Some small parcels have generated a lot of public comment; many have generated none.

Program Funding

Each year since 1994, some of the settlement funds have been spent on small parcel acquisition. To date, the Council has spent $18.5 million to purchase 7,100 acres and has approved roughly $3 million in offers on an additional 1,400 acres. The Council's March 1 resolution identified several other parcels on which a total of approximately $2.4 million in purchase offers is expected to be made through FY 02. As discussed above, administrative costs of the small parcel program are funded through Project /126.

Outcome of Current Process

Of the approximately 382 small parcels nominated to date, of which all but four have now been evaluated, 6 ranked HIGH and 13 ranked MODERATE. The balance ranked LOW or failed to meet threshold criteria. (The HIGH, MODERATE, and LOW classifications are based on the observed breaks in the distribution of scores for the 262 parcels nominated in response to the 1994 and 1995 public solicitations.) Of those in the LOW category, the Council has designated 52 individual parcels as parcels meriting special consideration. Several of these had scores of 18, which is just below the cutoff for the MODERATE classification. In addition, in conjunction with the purchase of large parcels of land on Shuyak Island from the Kodiak Island Borough and in Prince William Sound from the Tatitlek Corporation, the Council designated as parcels meriting special consideration all of the parcels to be purchased as part of the following packages: Kodiak Island Borough Tax Parcels, Larsen Bay Shareholder Parcels, and Tatitlek Homesite Parcels (total number of parcels not yet known).

RANK	NUMBER OF PARCELS
High	6
Moderate	13
Low (includes PMSC)	about 230
Didn't meet threshold criteria	about 129

Of the 44 small parcels purchased by the Council to date, three parcels were ranked HIGH, seven parcels were ranked MODERATE, and 34 were ranked LOW but designated parcels meriting special consideration. The Council has made offers to purchase 19 additional parcels -- of these, one parcel is ranked MODERATE, six are ranked LOW but designated parcels meriting special consideration, and 12 were designated parcels meriting special consideration from the outset (as part of the packages noted above). Negotiations that may lead to offers are underway on several additional parcels. Of these, one is ranked HIGH, one is ranked MODERATE, two are ranked LOW but designated parcels meriting special consideration, and the rest were designated parcels meriting special consideration from the outset (as part of the packages noted above).

Discussion of Current Process in Regard to Future Program (FY 2002 & Beyond)

Program Administration: *Should the Council or a non-profit administer?*

The Conservation Fund submitted a letter to the Council in December 1997 describing how it might administer a small parcel program. The Conservation Fund, which is a national land trust responsible for protecting 1.4 million acres throughout the country, has participated in some of the Council's small parcel acquisitions. The Nature Conservancy or a local land trust may also be

interested in administering a small parcel program. A non-profit may have more flexibility and more ability to be innovative in administering a small parcel program than the Council and government agencies do. A non-profit would also have the advantage of being able to leverage funds with funds from private donors and other contributors. On the other hand, the current Council/agency administrative process is in place and functioning; transferring authority for the program to a non-profit may require new state or federal legislative authorization to proceed.

Parcel Nomination: *Should there be another broad public solicitation?*

The broad public solicitations conducted at the initiation of the small parcel program (1994 and 1995) resulted in a large number of nominations that did not meet threshold criteria (almost 50 percent), as well as a large number that ranked LOW. Evaluating and ranking the large volume of nominations received required a significant commitment of resources. The fact that over 120 nominations have been received since the two solicitation periods closed suggests that the groundwork laid by the program to date has created a general public awareness of the program. In addition, the resource agencies seem to be generally knowledgeable about remaining restoration/protection opportunities. However, new opportunities to protect habitat are likely to continue to arise, and without a broad public solicitation important restoration opportunities may be missed. In addition, if the administration of the program were transferred to a non-profit, or if the criteria governing evaluation of small parcels were to change, a public announcement would be warranted.

Parcel Evaluation and Ranking

Threshold criteria: *Are the criteria still appropriate?*

The criterion that each parcel be linked to restoring an injured resource/service may exclude parcels that would provide opportunities to enhance, rather than directly restore, an injured resource/service or that might contribute a more general ecosystem benefit. The Council's habitat protection program was designed to provide injured species added protection over the period they need to recover naturally. While this is clearly still applicable today for many species, it may not be applicable over the longer term. The Council's proposed Gulf Ecosystem Monitoring (GEM) program emphasizes not only recovery but the long-term health of the ecosystem as well. Another example of a broader purpose comes from the Nature Conservancy's habitat protection handbook: "The purpose of land conservation is to insulate ecologically significant natural resources from urgent threats to their existence so that the resources have a reasonable chance of survival."

Parcels may also be excluded by the criterion that the purchase be at or below fair market value. Some of the Council's large parcel acquisitions have been for more than fair market value, and similar flexibility in the small parcel program might result in additional opportunities to protect key

habitat. On the other hand, this criterion has greatly simplified negotiations with landowners in regard to price and probably has allowed the Council to maximize its small parcel acquisition funds.

The agency sponsorship criterion might also be reviewed. In at least two instances, lands purchased by the Council have been transferred to a city or borough government. Some non-governmental organizations, such as the Nature Conservancy and various other trusts and organizations, also hold and manage lands. Waiving this criterion might allow for protection of parcels that contain key habitat but that do not fit into an agency's management scheme or for which agency funding for management is not available.

Evaluation criteria and formula: *Are the criteria and formula still appropriate?*

The large majority of parcels purchased or under consideration for purchase were not ranked HIGH or MODERATE but rather were designated parcels meriting special consideration. This suggests that the current evaluation criteria and formula are not adequately identifying all of the parcels that are of high priority for restoration and that some changes to the evaluation process may be warranted.

EMPHASIZE MANAGEMENT BENEFITS

An analysis has not been done of exactly why the parcels meriting special consideration ranked LOW. In most instances, though, this special designation was made at the request of a resource management agency, suggesting that the current formula may not place adequate value on management benefits. In the current evaluation system, "linkage" and "protection" are each awarded up to five points; "management" is awarded up to three points. In scoring a parcel, this serves to place lesser value on management benefits than on linkage or protection. For example, placing more emphasis on a parcel's relationship to surrounding land that contains linked habitat and on the pattern of adjacent land ownership and management might result in higher rankings for inholdings in existing conservation units. The Nature Conservancy handbook states that "ranking considerations [should] include the proximity to other protected areas."

REVISE OTHER ASPECTS OF THE EVALUATION CRITERIA

Other aspects of the current evaluation formula may also help explain the LOW scores. Criteria that might be worth reviewing:

- Definition of key habitat. For example, the current definition excludes feeding habitat and migration corridors. By contrast, the large parcel definition includes feeding and migration.
- Definition of public use in regard to link to an injured service. For example, the current definition of public use is "the only public access or... the only or best subsistence, sport fishing, [etc.] site in the area." By

contrast, the large parcel criteria simply refers to high public use.
• Scoring system. For example, the current yes/no formula does not allow parcels to be scored based on their relative value within a particular category, i.e., a parcel either contains key habitats or it doesn't. This differs from the large parcel evaluation formula, which emphasizes "degree of linkage" to an injured resource/service. Under the large parcel formula, each of 15 resources/services is ranked high, medium, or low; 7 additional questions are answered yes or no.

Large parcel formula = [sum of high + (0.5 x sum of medium)] x sum of yes

Similarly, the Nature Conservancy handbook states that ranking considerations include "the uniqueness of the natural feature, the present condition of the feature, the severity of threats, the urgency to actively manage the habitat or site," all of which allow assessment of the relative or comparative value of the parcels being evaluated.

RELY ON AGENCY PRIORITIES

In lieu of the current evaluation and scoring scheme, a process relying on agency priorities could be put in place. Priorities could be defined based on agencies' internal evaluations and individual needs. This approach would be much like that being used currently for the Kodiak Island Borough Tax Parcels, the Larsen Bay Shareholder Parcels, and the Tatitlek Homesite Parcels. A lump sum has been approved by the Council for each of these packages, and the individual parcels to be purchased are selected by the authorized agency (DOI in the case of Kodiak and Larsen Bay; USFS in the case of Tatitlek). The Council approves purchase offers based on a presentation by the agency of each parcel's benefits. This approach is also much like that described in the Conservation Fund's letter, which would base purchase selections on (1) agency priority, (2) degree of threat, and (3) financial performance of the small parcel fund. Another consideration is that an evaluation formula, such as that currently in place, is time consuming to develop, test, and validate. An agency priority approach would be simpler to develop and implement, and perhaps be of a more appropriate scale for the smaller program envisioned for FY 02 and beyond.

EMPHASIZE REGIONAL DISTRIBUTION

A September 1994 memo from the Chief Scientist and the core reviewers recommends that the Council's habitat protection program be geographically balanced throughout the spill area in order to provide optimum protection. The majority of acreage purchased to date through the small parcel program is in the Kenai region -- over 5,000 acres compared to roughly 1,000 acres in the Kodiak region and 358 acres in Prince William Sound. The majority of acreage protected through the large parcel program is in the Kodiak region -- 331,000 acres compared to

roughly 248,000 acres in Prince William Sound and 56,000 acres in the Kenai region. No large or small parcels have been purchased in the Alaska Peninsula region.

Appraisal and Negotiation: *Is the current 12-step process still appropriate?*

Streamlining the appraisal process may provide cost savings important to the smaller program envisioned for FY 02 and beyond. For example, the current process involves a contract appraiser (hired by the relevant resource agency), a state review appraiser, and a federal review appraiser for each parcel. Another issue to consider is whether the Council should delegate its authority to authorize appraisals to the Executive Director, as it had prior to the soft moratorium being in place. If administration of the program were transferred to a non-profit, the question would arise of whether this authority should be delegated to the non-profit or remain with the Council/Executive Director.

Offer to Purchase / Reciprocal Conservation Easement: *Should a reciprocal conservation easement still be required on each parcel? Should each offer to purchase still require Council authorization?*

In planning the smaller program for FY 02 and beyond, it may be appropriate to reconsider the necessity of continuing the reciprocal conservation easement policy. It adds a step to the acquisition process and necessitates both the state and federal governments being actively involved in each acquisition. The latter question, regarding who authorizes offers to purchase, would arise if administration of the program were transferred to a non-profit.

Public Comment: *Should public review be a formal step in the process?*

In some instances there has been short notice of which small parcels are on the Council's meeting agenda, and people wishing to comment may have had little practical opportunity to do so. Requiring a 30-day public comment period, for example, would improve the opportunity to comment, but would add more time and cost to the acquisition process and may delay bringing acquisition deals to closure. If the administration of the program were transferred to a non-profit, including some public process stipulations may be necessary because non-profits are not bound by the open meeting requirements that the Council is bound by.

Program Funding: *How should the March 1 resolution's provision that the $55 million be managed as a long-term funding source be implemented?*

Issues to be addressed include whether the fund will be a declining-balance fund (i.e., drawn down over time and liquidated by a specified date) or whether it will be managed as an endowment with only the earnings available for expenditure. If the latter, a decision on whether or not to inflation-proof would need to be made. Inflation proofing would preserve the integrity of the fund principal, but would leave a smaller amount of earnings available for expenditure each year. An investment strategy would also need to be developed and an investment manager identified. [NOTE: Of the $55 million, as much as $25 million may be

used for an eventual Karluk/Sturgeon rivers protection package. Annual earnings on the $30 million balance, calculated at the conservative rate of five percent, would be roughly $1.5 million. Administrative costs, as well as parcel acquisition costs and any inflation proofing, would be paid from this sum.]

POSSIBLE FUTURE SMALL PARCEL ACQUISITION OPPORTUNITIES

Kodiak Region

Future possibilities

The Council's March 1 resolution designates an additional $241,000 for the Kodiak Island Borough Tax Parcels and an additional $585,000 for the Larsen Bay Shareholder Parcels ($174,000 from the original $1 million allocation for these two packages have already been committed through offers to purchase). Both packages are focused on purchasing inholdings in the Kodiak National Wildlife Refuge. DOI is to identify for the Council by January 15, 2000 the potential parcels to be purchased with these funds and whether additional funds might be needed in the future to complete acquisition of the available parcels. These parcels are typically located at strategic access points and frequently in riparian areas with high fish, wildlife, habitat, subsistence, recreation, and archaeological values.

Two parcels totaling 280 acres on Kiliuda Bay (KAP 1256 and KAP 2027) were nominated in March 1999 and are currently with the review team for evaluation. If the state/Old Harbor Corporation land exchange, which is related to the Old Harbor large parcel acquisition, moves forward, the state might be interested in acquiring additional inholdings in the Kiliuda Bay area.

In addition, the Karluk Weir parcel (KAP 150), a 5-acre parcel owned by the Karluk IRA Council, is not currently available for purchase but may be a priority if it were to become available. Purchase of this parcel, which was nominated in 1994 and ranked MODERATE, would ensure a permanent weir site on the Karluk River, which is necessary to properly manage the river's fisheries resources. The Long Island parcel (KAP 1058), a 1,462-acre parcel owned by Lesnoi, Inc., also ranked MODERATE, but has been a lesser priority for protection than the Termination Point parcel (KAP 145), on which an offer is currently being considered. The Long Island parcel, which is boat-accessible from Kodiak, has strong recreation values. Lesnoi, Inc. has also worked with the Kodiak Island Borough to develop a package of over 2,000 acres of mostly road-accessible beachfront south of Chiniak. The Borough may seek funds from the Council to purchase this land.

In progress

Offers are under review on 1,261 acres, including Termination Point.

Purchases to date

To date, 1,055 acres have been purchased in the Kodiak region through the small parcel program.

Kenai Peninsula

Future possibilities

Potential habitat protection opportunities remain along the Kenai River. In early 1997, a multi-agency work group (USFWS, USFS, ADFG, ADNR) identified all of the privately-owned parcels (roughly 3,000 acres), as well as the parcels owned by the City of Kenai (roughly 2,000 acres), that had at least 1/8 mile (660 feet) of riverbank. Although it is likely that many of these parcels will never be for sale, it is also likely that some of them will be for sale in the future. There may also be important parcels near but not along the river (e.g., contiguous wetlands and migration corridors) and parcels with less than 1/8 mile of riverbank.

Protection of habitat along the Kenai River's tributaries and along other important rivers on the Kenai Peninsula -- such as the Anchor, Ninilchik, Kasilof, and Killey rivers --- may warrant consideration. Inholdings in Kenai Fjords National Park and Kenai National Wildlife Refuge may become available in the future.

In addition, the Baycrest parcel (KEN 12), on which the Council's earlier purchase offer was rejected, has been reconfigured and renominated by the landowner. This 42-acre parcel is currently with the review team for evaluation. The Deep Creek parcel (KEN 1001), a 91-acre parcel owned by the Ninilchik Native Association, is not currently available for purchase but may be a priority if it were to become available. This parcel, which was nominated in 1995 and ranked MODERATE, has high recreation values. The Hopkins parcel (KEN 146), which was nominated in 1994 and ranked LOW, has generated some public interest and is valued by managers for public access on the north side of Kachemak Bay.

In progress

Offers are under review on 47 acres. In addition, purchase negotiations are underway on the Stariski Creek parcel (KEN 12), for which $500,000 is designated in the Council's March 1 resolution.

Purchases to date

The Kenai River has been the focus of the Council's habitat protection efforts on the Kenai Peninsula. To date, 12 parcels comprising 5,100 acres along the river have been purchased at a cost of $11.8 million. (An additional 107 acres along the river have been purchased with roughly

$1.6 million in EVOS criminal funds.) In all, the Council has purchased 5,679 acres on the Kenai Peninsula through its small parcel program.

Prince William Sound

Future possibilities

The Council's December 1997 resolution authorizing protection of lands around Irish Cove (part of the Tatitlek large parcel protection package) also committed Tatitlek Corporation to pursuing Council acquisition of additional homesite lots in the Two Moon Bay and Snug Corner Cove subdivisions. The Council's March 1 resolution designates $205,600 for this purpose (an amount equal to the balance of "the amount previously authorized but no longer needed" for the Tatitlek large parcel acquisition). There are 164 homesite parcels and all but 20 are potentially for sale. Although the value of the parcels is not yet known (appraisals are underway by USFS and should be completed by October 15, 1999), it is likely that funds in addition to the $205,600 already approved by the Council will be needed if all of the available homesites are to be purchased.

In progress

Purchase negotiations are currently underway on the Duck Flats and Jack Bay parcels (PWS 05, PWS 06, PWS 1010), for which $880,000 is designated in the Council's March 1 resolution. At the direction of the Council, these parcels will be removed from consideration if a purchase agreement is not reached by January 15, 2000. Offers are under review on an additional 101 acres.

Purchases to date

To date, 358 acres have been purchased in Prince William Sound through the small parcel program. This is less acreage than has been purchased in either the Kodiak or Kenai regions and reflects the fact that there are not many privately owned small parcels in the sound.

Alaska Peninsula

Future possibilities

A 2.5-acre parcel in Chinitna Bay (KAP 1257) was nominated in May 1999 and is currently with the review team for evaluation. Inholdings in the Alaska Peninsula Wildlife Refuge and the Becharof National Wildlife Refuge may become available in the future.

In progress

None

Purchases to date

None

Parcels Over 1,000 Acres

The March 1 resolution specifies that a "significant proportion" of the $55 million in Restoration Reserve funds allocated to the habitat program are to be used for small parcels and that any other potential habitat acquisitions would also be made from this allocation. Although the focus of this memo has been on small parcels, it is worth noting that there may be opportunities in the future for additional large parcel acquisitions as well.

REFERENCES

Comprehensive Habitat Protection Process: Large Parcel Evaluation & Ranking, Volume I, EVOS Habitat Work Group, November 30, 1993.

Comprehensive Habitat Protection Process: Small Parcel Evaluation & Ranking, Volume III, EVOS Habitat Work Group, February 13, 1995 and Supplement July 15, 1995.

Letter from Brad Meiklejohn, The Conservation Fund to Molly McCammon, EVOS Executive Director, April 8, 1997.

Options for Identifying and Protecting Strategic Fish and Wildlife Habitats and Recreation Sites: A General Handbook, The Nature Conservancy, December 1991.

Small Parcel

Work with Restoration Work Force and other individuals from agencies who have been involved in the small parcel program, as well as with representatives from the non-profit sector who are involved in habitat protection and the Public Advisory Group, to do the following:

By February 2000 --

Develop recommendations on:

(1) Changes to the evaluation and ranking process so that it more adequately identifies all of the parcels that are of high priority for restoration

(2) How to solicit parcel nominations in the future

(3) Ways to streamline and reduce costs of process

Longer term decisions --

(1) Fund management (declining balance vs. endowment, investment strategy, inflation proofing)

(2) Public comment and involvement, including role and make-up of PAG

(3) Possible non-profit administration
- How it might work with various specific entities
- What continuing role for TC might be
- What administrative and legal issues would need to be addressed in delegating TC's authority

rec

Parcel ID: Larsen Bay 10-Acre Parcels
The Conservation Fund
EVOS Parcel Numbers 1092-1099, 2000-2007, & 2024

Rank: N/A **Acreage:** 163.64 **Agency Sponsor:** USFWS

Appraised Value: $254,000

Location: Uyak Bay, Kodiak Island

Landowner: The Conservation Fund

Address: 1800 North Kent Street, Suite 1120
Arlington, Virginia 22209-2156

These seventeen parcels are located on the shoreline of Uyak Bay, south and east of Amook Island, within the Kodiak National Wildlife Refuge. They are portions of the land conveyed by Koniag, Inc., to the Larsen Bay Tribal Council, and further conveyed to tribal members. These parcels were conveyed by Tribal members to The Conservation Fund. The parcels are generally bounded by lands purchased by the United States from Koniag, Inc., through funding provided by the *Exxon Valdez* Oil Spill Trustee Council. These parcels would become part of the Kodiak National Wildlife Refuge. The accessibility and natural values of the properties give them significant development potential. These parcels have restoration benefits in their own right, though the greatest benefit of their acquisition may well be the elimination of highly developable inholdings with easy access. Incompatible development on these inholdings would markedly detract from the restoration benefits achieved by the major acquisition of the surrounding Koniag lands and create significant natural resource management problems for the Kodiak National Wildlife Refuge.

The shoreline locations results in a rich intertidal zone typical of the protected waters of Uyak Bay. Sea otters widely use the area. These parcels and the surrounding land and water are used by residents of the area for subsistence purposes primarily for hunting brown bear and Sitka black-tailed deer, harvesting salmon, and berry picking. Pink and sockeye salmon and dolly varden spawning streams run through the area entering Uyak Bay. The associated riparian habitat is used for nesting by harlequin ducks. Colonies of pigeon guillemots occur near the property, where they feed in near shore marine waters that also host marbled murrelets, wintering sea ducks and loons. There are several documented bald eagle nests within the area. The properties have not been intensively explored, but probably contain cultural sites based on the rich archeological resources of the lands bordering Uyak Bay.

Developments have been occurring on a number of tracts in the vicinity. These developments are generally cabins used for recreational and subsistence hunting and fishing. These sites have significant potential for expansion into more intrusive development. Continued development in this area could adversely impact water quality and fish and wildlife habitat. The acquisition of these parcels will help to preserve the wildlife, habitat, wilderness, recreational, and subsistence restoration benefits of the Koniag large parcel acquisitions and enhance sound natural resource management.

The Conservation Fund
10-Acre Parcels
Uyak Bay, Alaska

FWS #	EVOS #	Parcel Owner	General Location	Size	Appr Value	Current Status
90	1092	Conservation Fund	Amook Pass	9.69 acres	12,000	Purchase agreement signed
91	1093	Conservation Fund	Browns Lagoon	10.00 acres	12,000	Purchase agreement signed
92	1094	Conservation Fund	Browns Lagoon	13.17 acres	15,000	Purchase agreement signed-title problems
93	1095	Conservation Fund	Browns Lagoon	8.94 acres	18,000	Purchase agreement signed
94	1096	Conservation Fund	Amook Pass	10.00 acres	11,000	Purchase agreement signed
95	1097	Conservation Fund	Amook Pass	10.96 acres	15,000	Purchase agreement signed
96	1098	Conservation Fund	Amook Pass	9.28 acres	14,000	Purchase agreement signed
97	1099	Conservation Fund	Amook Pass	9.09 acres	15,000	Purchase agreement signed
98	2000	Conservation Fund	Amook Pass	10.74 acres	15,000	Purchase agreement signed
99	2001	Conservation Fund	South Uyak Bay	10.37 acres	20,000	Purchase agreement signed
100	2002	Conservation Fund	South Uyak Bay	8.34 acres	15,000	Purchase agreement signed
101	2003	Conservation Fund	South Uyak Bay	9.68 acres	16,000	Purchase agreement signed-title problems
102	2004	Conservation Fund	South Uyak Bay	7.02 acres	15,000	Purchase agreement signed
103	2005	Conservation Fund	South Uyak Bay	6.88 acres	18,000	Purchase agreement signed
104	2006	Conservation Fund	South Uyak Bay	8.52 acres	13,000	Purchase agreement signed
105	2007	Conservation Fund	South Uyak Bay	12.32 acres	14,000	Purchase agreement signed
132	2024	Conservation Fund	South Uyak Bay	8.64 acres	16,000	Purchase agreement signed
17 parcels				163.64 acres	$254,000	

Uyak Bay
10 Acre Taxlots

Kodiak NWR

Uyak Bay

Larsen Bay

Karluk Lake

T30S,R28W
SM

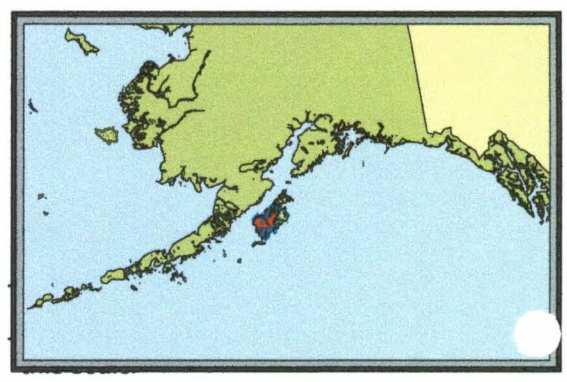
T32S,R30W
SM

T32S,R28W
SM

1092
1095
1093
1094
1097
1096
1098
1099
2000
2006
2007
2001
2024
2002
2004
2005
2003

Legend

- Native Corporation Owned
- Other Private
- Other Federal
- Conveyed Native Allotments
- KIB Owned
- TCF Owned
- Signed Argreements
- 10 Acre Taxlots
- US Acquired Native Allotments
- US Acquired Native Allotments With CE to State
- US Acquired Other Private
- US Acquired from Koniag With CE to State
- Koniag Owned/US Non Development Easement Expires 12/2/2001
- Lands Off Kodiak NWR



October 19, 1999

GARY WILKEN
SENATOR
Districts 29 & 30
West Fairbanks

Senate Standing Committees
Member: Finance
Member: Health, Education, & Social Services (HESS)
Member: Legislative Budget & Audit
Member: State Affairs

Alaska State Legislature
Senate

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October 21, 1999

Ms. Molly McCammon, Executive Director
Exxon Valdez Oil Spill Trustee Council
645 G Street
Anchorage, AK 99501

Dear Ms. McCammon,

It is my understanding that the Exxon Valdez Oil Spill Trustee Council will consider the Gulf Ecosystem Monitoring (GEM) project and the expenditure of the research endowment of $115 million at its next meeting.

On May 7, 1999 the Legislature passed House Joint Resolution 13, *University Endowment for Research*. Consistent with this resolution, I respectfully request the Trustee Council support the establishment of endowed chairs at the University of Alaska in relevant areas of research, instruction, and public service.

Thank you very much for your consideration of this request.

Sincerely,

Gary Wilken
Senator, West Fairbanks

October 21, 1999

Exxon Valdez Oil Spill Trustee Council
645 "G" Street, Suite 401
Anchorage, Alaska 99501

RE: Public comment on the need for better oil spill cleanup technology.

Dear EVOS Trustees:

Attached is news article that appeared in today's Anchorage Daily News about another oil spill in Alaskan waters. The spill occurred in the heart of the EVOS spill area at Eyak Lake near Cordova.

Since the spill in 1989, it has been well known that large areas of the seabed were coated with Exxon Valdez oil. A few months ago, nearly ten years after the spill, there were reports of Exxon Valdez oil seepage into Prince William Sound from seabed sources. In addition, other news reports this year showed oil still remaining on beaches just below the beach surface. Several oil spills have occurred in Alaskan waters since the 1989 spill.

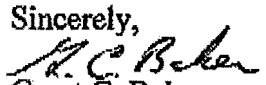
In June, there was a news story about a Seattle firm developing and marketing a biological "bug" that eats oil. Currently, smaller boats commonly use dish soap to control oil spilled or pumped from bilge waste. But, dish wash soap is harmful to fish life. The biological product is being marketed as a harmless replacement for dish soap that boats of all sizes can use. Obviously, development of this and other similar products are exactly what is needed to help restore, enhance, and protect living resources and habitat of spill areas.

A serious program needs to be established that conducts research for developing oil spill cleanup technology. This technology can help cleanup EVOS oil and protect the EVOS areas, including Eyak Lake, from other spills from a variety of sources. Furthermore, the technology can be marketed around the world and generate substantial incomes for the EVOS spill endowment. Finding better investment methods was one objective of the March 1999 EVOS Resolution.

The basis given for rejection of Project No. 00474 of the FY 00 Draft Work Plan should be reconsidered. Rejection of the project is a far smaller concern than the basis given for denial of funding. Development of oil spill cleanup technology should not be rejected because it can clean up future spills in addition to EVOS oil. The research referred to in the project, and in this letter, is not being conducted at Oil Spill Recovery Institute. But, the Institute's efforts would certainly be enhanced by such research. Future protection of EVOS areas is a reason given for the purchasing of land with EVOS funds. Certainly, true protection of EVOS areas by preventing oil from reaching the shore, or by reducing the destruction caused by oil contamination, is also important. Better oil spill cleanup technology is needed.

There were warnings before the 1989 spill about inadequate oil spill cleanup technology and response capability but they were ignored until it was too late. The oil spills since 1989 have highlighted how unprepared we still are for protecting Alaskan shores and lakes from oil spill damage including EVOS areas. Something more needs to be done and this is the time get the work underway. Thank you.

Sincerely,



Grant C. Baker
P.O. Box 240986
Anchorage, AK 99524

Anchorage Daily News
October 21, 1999

Oily water overflows at Eyak Lake

CORDOVA — Heavy rains and an equipment failure caused thousands of gallons of oily water to overflow from a storage tank at Cordova Electric Association's power plant on Eyak Lake on Tuesday, state environmental officials said. The state Department of Environmental Conservation said as much as 4,000 gallons of waste oil spilled from the tank, with about 400 gallons of that amount spilling out of a containment area. A vacuum truck was being used to clean up oil, and boom was deployed to keep more of the oil from reaching the lake. About 150 to 200 yards of the lake's shoreline was oiled, DEC said. The water volume from rain overwhelmed an oil-water separator pump at the plant. An automatic shutoff mechanism on the pump failed, causing excess water to be pumped into the 10,000-gallon storage tank, DEC said.

October 21, 1999

Exxon Valdez Oil Spill Trustee Council
645 "G" Street, Suite 401
Anchorage, Alaska 99501
Fax: (907) 276-7178

RE: Public comment on the Gulf Ecosystem Monitoring (GEM) plan and the University.

Dear EVOS Trustees:

It is my understanding the GEM plan will be discussed at the October 22 meeting. I urge the Trustee Council to include the University of Alaska in its discussions and planning for the $115,000,000 EVOS research endowment. The initial GEM proposal discussed during last summer included several state and federal agencies, and a couple of outside universities for advising groups. But the University of Alaska was excluded. It does not make sense to exclude the main research institute in Alaska when making plans regarding the $115,000,000 EVOS research endowment. The initial GEM plan was consequently scratched.

If another GEM plan is being developed concerning the $115 million research endowment, then it seems to make sense to include the University. That would enable the research facilities and abilities of the University to be coordinated with the needs of the state and federal agencies and EVOS Trustee Council. This should save everyone time and make the effort much more effective and productive. Excluding Alaska's main research institute until after the GEM has developed criteria for spending research funds or "sometime down the road" essentially circumvents the University's involvement in key planning for research.

In light of the support shown by the many resolutions and letters from Alaskans for creating endowed chairs at the University with EVOS funds, including the overwhelming passage of HJR13 by legislators and Governor Knowles, it seems that including a work group from the University should happen. It makes sense that development of an EVOS plan for research funds would benefit from the input of the main research institute in Alaska.

In summary, including the University in planning for the research endowment is needed. Also, the public's request for EVOS endowing of research chairs at the University needs to be addressed in a meaningful manner. It promises many benefits for Alaskans and the EVOS work. Thank you for your time and efforts.

Sincerely,

G. C. Baker

Grant C. Baker
P.O. Box 240986
Anchorage, AK 99524

Chugach Regional Resources Commission

October 14, 1999

Molly McCammon, Executive Director
Exxon Valdez Oil Spill Trustee Council
645 G Street, Suite 401
Anchorage, Alaska 99501

Dear Molly,

In preparation for our meeting tomorrow, I thought it would be helpful to provide you with an overview of the field trip and natural resource management program development workshop held in Northern Wisconsin on September 27-October 3, 1999, along with the results of the final day's meeting. First, I would like to thank you for taking an active interest in what we are doing with the communities in the oil spill affected area in regards to stewardship of the natural resources. I regret that you were unable to make the trip but greatly appreciated the opportunity to include Sandra Schubert in our meetings. I trust she has already provided you with her perspective of the workshops and I hope her participation has given you a better insight into our vision for the future.

As described in the Community Involvement Project FY00 detailed project description, this workshop was held to allow communities the opportunity to observe, compare, and understand the functions of a tribal natural resource program. Lac du Flambeau was an ideal choice as their program has been operating since 1980, so has all the components of a fully operational tribal program. The expectation is that some activities under the Gulf Ecosystem Monitoring program will encompass Tribal stewardship, research, and monitoring. There were a total of 18 participants comprised of village chiefs/presidents, vice-presidents, village council members, tribal administrators, community facilitators, tribal natural resource specialists, and CRRC staff.

As you know, the workshops were held in cooperation with my tribe, the Lac du Flambeau Band of Lake Superior Chippewa Indians. The week began with a short tour of the Tribe's newly constructed state-of-the-art fish hatchery and the traditional use areas on the reservation, including cultural, historic, and subsistence sites/areas. The first evening was spent with the Lac du Flambeau Tribal Council discussing natural resource management issues and opportunities for cooperation.

4201 Tudor Centre, Suite 300, Anchorage, Alaska 99508, 907 / 562-6647, FAX 907 / 562-4939

On Wednesday the group traveled to the Bad River reservation in Odanah for a meeting with the Great Lakes Indian Fish & Wildlife Commission (GLIFWC) staff. The Commission's main goal is off-reservation management of natural resources. This organization has many excellent models for co-management, as well as models for management of public lands, which I think, is similar to Alaska tribes working with their village corporations to conduct management activities. This could also be seen as a model for state/tribal cooperative projects here in Alaska. This field trip to the GLIFWC headquarters was an eye-opening experience for many of the participants. GLIFWC staff detailed the treaty history of Tribes in the Great Lakes region, including Wisconsin, Michigan, and Minnesota, as well as the history and hard work that took place to become a organization with extensive scientific research, monitoring, and data management capabilities. The possibilities presented were both encouraging and daunting to many attending. With a staff of over 80 people at GLIFWC, they experience difficulties with hiring Indian individuals for scientific level positions (4 Native biologists on staff right now), but continue to make strides to alleviate that problem. The GLIFWC presentation, I believe, has moved the vision of many of the Tribal leaders in the oil spill affected area to work toward capacity building for their communities.

After we returned to Lac du Flambeau, we toured the tribal museum and met with the museum's curator who spoke with the group about museum management, handling of artifacts, operational costs, and maintenance.

The entire day on Thursday was dedicated to the Lac du Flambeau Tribal Natural Resource Department. The Natural Resource Director provided a broad overview of the tribe, its land area and ownership status, and a brief review of their programs during the morning session. All the program directors were invited to the afternoon session to give more detailed information about their respective programs. Programs under the Tribal Natural Resource Department include Fish Culture, Fisheries Management, Wildlife Management, Conservation Law Enforcement, Forestry, Water Resources, Parks and Recreation, Historic Preservation, Environmental Protection. The Chief Tribal Judge was also present to provide information to the participants regarding the Tribal Courts. These presentations reinforced many of the ideas presented the previous day. It is quite evident that Lac du Flambeau's Tribal Natural Resource Department is deeply involved in all resource issues affecting the reservation, and have accomplished this by developing their technical capability to do so. Though the Tribal casino revenues partially fund many of the projects, their Natural Resource Department began in the early 80's with grants and a limited amount of funding available (very similar to the Alaska tribes). Once a small program with two seasonal, part time workers, the department now boasts 23 fully trained, full time tribal employees working in all aspects of natural resource management.

On the final day of the workshop, all the participants met to share their perspectives of the programs they had observed, and to discuss the impacts and impressions that the trip had on their vision for the region and their tribal communities. Many of the Tribes felt very strongly about moving forward with the development of local natural resource management plans, tied together with a region-wide natural resource management plan, with development being facilitated by the technical assistance of Chugach Regional Resources Commission. A timeline of the end of FY00 was identified to complete both of these essential projects.

The development of a region-wide natural resource management plan will tie together, add to and strengthen the individual tribal efforts that currently exist. This plan will also give the existing programs a more scientific and statistically valid basis as well as include additional aspects and areas of resource management that the tribes have been considering, but have yet to initiate. It will set forth the policies and procedures for a region wide natural resource management program designed to meet tribal needs and concerns on a regional level and will be used as model for development of local tribal natural resource management plans. These plans will then form the basis for partnering with federal and/or state natural resource management agencies. A typical partnering scenario would have the tribe(s) and the agency jointly developing the protocols and the tribe(s) doing the data collection and analysis under agency guidance. Ultimately the tribes will have developed their technical capacity to a level where they will be on equal footing with state and federal agency scientists, with tribal biologists of their own, speaking from a subsistence management philosophy.

The final topic of discussion was regarding the Gulf Ecosystem Monitoring (GEM) program. Henry Huntington, who has a very good understanding of the intent and direction that is indicated in the document, prefaced the GEM discussion. Participants immediately expressed dissatisfaction with the lack of tribal involvement in the planning process and in the formation of the plan. I realize that Henry and Hugh were both included in the GEM working group, but I hope you understand that they, in no uncertain terms, do not represent the tribal communities. My understanding was that they would provide their technical expertise in traditional knowledge and how best to keep communities involved in research and monitoring . . . not to provide a community perspective. I see their participation as a step in the right direction, but not a substitute for actual Tribal representation at the formation meetings. I would hope that we could find a way to include the tribes in this process in the future based upon the fact that the federal government does have a trust responsibility to work with the tribes on a government-to-government basis. The tribes are not just another user group, but sovereign governments who I feel deserve to have an equal voice in this process, along with the state and federal governments.

Additional criticism of the GEM plan focused on three major areas. First, the obvious exclusion of the human uses and perspective when looking at the ecosystem. This has been a recurring problem in the EVOS process, but one that will not simply go away. A real effort needs to be made by the Trustees to somehow include the human element when looking at injured resources and species. The holistic approach that Native culture views as essential in their worldview is contrary to the narrow view of injured resources taken by the Trustee Council. I am willing to work with you to address this more effectively.

Second, the discussion of opportunities for Tribal and community monitoring, research, and community-based projects is very limited in the document. I had hoped that the involvement of Tribes and other Native organizations would be integrated throughout the plan, but was very disappointed when I realized it was not. When discussing work that has been done by agencies, any mention of scientific work that CRRC and their member tribes have conducted over the years was conspicuously absent. We have conducted several science-based projects that restore injured species and lands (some of them with other than EVOS funding), and I think that these

projects should be recognized as a record of our past involvement and commitment to our continued involvement throughout the life of the Restoration Reserve.

Third, the $20 million Tribal Community Fund taken to heart by so many in the region does not receive any mention in the plan. Tribal leaders at the workshop left the meeting in frustration due to the fact that they put in countless hours collecting signatures on petitions and letters of support for the Tribal Community Fund. All of this hard work in trying to get the Trustee Council to see how much support there is for such a fund was perceived as a waste of time. I understand the reasoning behind not wanting to mention the Tribal Community Fund in the GEM, particularly since there has been no Trustee Council action on it. I do believe, however, that the language should be broad enough to allow the tribal communities with a window of opportunity to include the Tribal Community Fund later on in the GEM planning process.

At the direction of the CRRC Board and village chiefs, CRRC is working with the Tribes in the region to implement comprehensive resource management plans, as well as continue to develop programs that will offer the ability to bring technical knowledge and professional experience to the Tribal level. Tribes are moving in the direction of cooperative management of important resources they depend upon for subsistence and cultural uses, as well as stewardship of the lands and habitat in their traditional use areas. The tribes are anxious now more than ever to further develop their Tribal natural resource programs in order to address environmental and natural resource issues in the region. I have been directed by the village chiefs to make this a priority.

I believe the Gulf Ecosystem Monitoring program can play an important role in this process by involving Tribes in the research, monitoring and stewardship of natural resources and lands in the oil spill affected area. I welcome any opportunity to work with you and your staff to see that this happens.

Thank you for the opportunity to share this information with you. I hope that it proves helpful in giving you a better understanding of the region-wide focus of Tribes in regards to Tribal natural resource management. I look forward to our meeting tomorrow

Best regards,

Patty Brown-Schwalenberg

Patty Brown-Schwalenberg
Executive Director

cc: Phil Mundy, Science Coordinator
Sandra Schubert
CRRC Board of Directors

The Nature Conservancy OF ALASKA

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Suite 200
Anchorage, Alaska 99501
TEL (907) 276-3133
FAX (907) 276-2584

International Headquarters
Arlington, Virginia

13 October, 1999

Molly McCammon, Executive Director
EVOS Restoration Office
645 G Street
Anchorage, AK 99501

Dear Molly:

I had a very fruitful conversation yesterday with Sandra Schubert on your staff regarding my impressions of the small parcel program and future options for the portion of the restoration reserve that could be allocated for habitat acquisition. My comments and our discussion hit a number of points that I am sure Sandra will incorporate into her findings. I'd like to capture some of the points from our discussion and add some additional thoughts that we have been kicking around with Mark Kuwada, John Schoen, Brad Meiklejohn and others.

The habitat acquisition work by the Trustee Council has been a major conservation contribution to Alaska. I want this to be the single over-riding observation in this letter.

I think, however, there are ways to streamline the evaluation process, to remove a low level of politicization that goes with the program, and to broaden the conservation impact. In particular, the suggestion has been made that a significant amount of restoration funds should be placed into an endowment to support land acquisition with the endowment potentially managed through the non-profit conservation sector. There are great merits in this notion and this type of approach can be designed to meet on-going restoration goals, broader conservation needs, and the public interest – if structured and administered appropriately.

Here is my somewhat solicited advice:

- Establish a fund through an existing or new organization; if in an existing organization, the fund should be managed as a dedicated, restricted fund. This "habitat conservation trust" would oversee investment, inflation-proofing, and earnings distribution (subject to guidelines established by the Trustee Council).
- The habitat conservation trust would not be a user of the funds but would make grants from the earnings (after inflation-proofing) based on a competitive process following specific ranking criteria (biological merit, threats, leverage, partnerships).
- A volunteer committee with appointed state, federal, and private representatives would guide this granting process. This committee would be supported by an

administrator hired through an existing organization to minimize on-going overhead costs.

- $25 million of restoration funds could be used as a carrot and challenge to the Alaskan conservation constituency to match this with private funding with a goal of doubling or tripling the initial investment.
- We could also look at a legislative strategy to get federal and state appropriations to match annual earnings. The fund could also grow by addition of fines levied against those who break state and federal environmental laws.
- The fund earnings would co-mingle EVOS, private, investment, and other funds. The EVOS percentage could be tracked with the goal of ensuring that the appropriate percentage continued to be spent in the spill area and/or on injured species. The non-federal percentage could be tracked so the fund earnings could be used as a pro-rated non-federal match to leverage additional habitat protection dollars from existing federal grant sources (National Fish and Wildlife Foundation, North American Wetlands Conservation Act, Wallop-Breaux, etc.).

The benefits of this kind of approach are many:

1. The Trustee Council could establish a permanent mechanism for on-going habitat protection without the need for the council to maintain the long-term infrastructure.
2. The pie would get significantly larger through the initial challenge/match approach.
3. The fund could be used to leverage additional federal money with each deal that is done. We currently lack any type of non-federal dedicated source of funds in Alaska, so miss a lot of opportunities to participate in federal matching programs.
4. A competitive re-granting process would ensure highest quality proposals and ensure that the funds do not become the exclusive domain of a particular agency or organization used to advance a narrow mission.

The broad public interest would be well served through this type of approach. Further, the EVOS settlement could be used to catalyze a statewide mechanism that will continue to benefit the spill area and injured species as well as other biologically important places throughout Alaska.

Thank you for soliciting my comments through Sandra and for taking time to consider the ideas in this letter. I am circulating this letter within the conservation community to stimulate discussion and gauge support. I would be very interested in discussing this further with you and recommend we convene a small group to kick the idea around. I look forward to hearing from you.

Sincerely,

Randall H. Hagenstein
Associate State Director

2655 v

THE CONSERVATION FUND

BRAD A. MEIKLEJOHN
ALASKA REPRESENTATIVE
9850 HILAND ROAD
EAGLE RIVER, ALASKA 99577
(907) 694-9060
FAX (907) 694-9070

June 18, 1998

Ms. Molly McCammon
Executive Director
Exxon Valdez Oil Spill Trustee Council
645 G St., Suite 401
Anchorage, AK 99503

Dear Ms. McCammon,

On behalf of The Conservation Fund, I want to commend you, your staff, and the entire Exxon Valdez Oil Spill Trustee Council for your habitat protection work. We believe that habitat protection has been the silver lining of the *Exxon Valdez* oil spill.

By implementing the restoration plan, the Trustee Council has done outstanding work to protect some of the finest wildlife habitat in North America, and we are grateful for your commitment to conservation. The large and small parcel acquisition programs have worked as natural complements to produce lasting habitat protection and restoration benefits throughout the spill zone. The Conservation Fund is pleased to have been a partner with the Trustee Council in protecting important lands on Kodiak Island and along the Kenai River.

While the habitat protection effort has produced outstanding results, more work remains. Opportunities to protect important sites will continue to arise throughout the spill zone, and we think there should be a funding source to realize these opportunities in future years. As you know, funding for habitat protection in Alaska is chronically scarce. We think the Trustee Council should set aside a significant portion of the Restoration Reserve for continued habitat protection into the 21st century.

The Conservation Fund endorses the concept of establishing a long-term funding source for habitat protection in the spill zone. Furthermore, we are prepared to manage such a fund or endowment for the acquisition of habitat. Enclosed you will find a proposal from The Conservation Fund for the creation and management of a *Small Parcel Permanent Fund.*

The Conservation Fund proposes to manage the *Small Parcel Permanent Fund* in partnership with Key Bank. Key Bank is a leading bank in Alaska, and manages a portion of Alaska's Permanent Fund. Careful investment and management of $20 million from the Restoration Reserve could provide a perpetual funding source for habitat protection in the spill zone.

Should the Trustee Council choose to create an account for habitat protection from the Restoration Reserve, we are ready and willing to examine the various available options, in support of the council's decision.

The Conservation Fund believes that an equitable division of the Restoration Reserve includes funding for habitat protection opportunities. Establishing a long-term funding source for habitat protection will extend the conservation impact of the Trustee Council into the 21st century.

Sincerely,

Brad Meiklejohn
Alaska Representative

SMALL PARCEL PERMANENT FUND

A Proposal from The Conservation Fund

The Conservation Fund proposes the creation of a *Small Parcel Permanent Fund* to maintain a program of habitat protection in the oil spill zone of the tanker *Exxon Valdez.* The Conservation Fund proposes that $20 million from the *Exxon Valdez* Restoration Reserve be invested and managed as a long-term funding source for small parcel acquisition.

Land acquisition is a very effective tool for solving resource conflicts. However, except for the *Exxon Valdez* oil spill money, funding for land acquisition in Alaska has always been scarce. The State Legislature is not expected to appropriate funds for habitat protection any time in the near future, and Alaska has never fared well in the national rankings for money from the Land and Water Conservation Fund. The *Small Parcel Permanent Fund* will be a long-term funding source to solve problems through direct purchase.

The Conservation Fund proposes to manage the *Small Parcel Permanent* Fund in partnership with Key Bank. Key Bank is a leading bank in Alaska, and manages a portion of Alaska's Permanent Fund. Careful investment and management of $20 million from the Restoration Reserve could provide a perpetual funding source for habitat protection.

Since 1994 The Conservation Fund has assisted the U.S. Fish and Wildlife Service, Alaska Department of Fish and Game, and Alaska State Parks in acquiring small parcels in the spill zone. The Conservation Fund has attracted a broad coalition of financial partners to the Kodiak small parcel effort, generating matching funds from businesses, non-profit groups, individuals, government agencies, and federal grants.

Exxon Valdez Oil Spill Trustee Council Small Parcel Program

The *Exxon Valdez* Oil Spill (EVOS) Trustee Council initiated the Small Parcel Program in 1994 in recognition of the strategic value of small tracts of land in a broad conservation program. Tracts as small as a few acres can control access, management, and fish and wildlife activity in a vast watershed. Inappropriate development of these small parcels can undermine protection of the surrounding uplands. The development threat is typically higher on smaller parcels because they are more readily bought and sold on the real estate market than larger tracts.

Opportunities to protect important habitat areas for spill-injured species will continue to arise unpredictably. We think it is important to develop a long-term funding source to take advantage of these opportunities. The *Small Parcel Permanent Fund* could address habitat protection needs in the spill zone for many years to come.

While the pool of available funds is dwindling, public support for habitat protection, particularly small parcels, remains strong. The *Small Parcel Permanent Fund* is a creative

way to terminate the Trustee Council's involvement with small parcels, to leverage EVOS money with matching funds, and to pursue habitat protection for many years to come.

The Conservation Fund - Alaska Acquisition Experience

The Conservation Fund is a national non-profit organization responsible for conserving 1.4 million acres of habitat and open space throughout the country. The Conservation Fund develops partnerships in pursuit of sustainable conservation solutions that integrate economic and environmental goals.

In Alaska, The Conservation Fund has established working relationships with realty staff, biologists, managers, and directors of the U.S. Fish and Wildlife Service, the National Park Service, the Alaska Department of Fish and Game, and Alaska State Parks, as well as Native corporations and private land owners. Since 1994 we have completed the following acquisitions:

- 318-acre gift at Uyak Bay (Kodiak National Wildlife Refuge, USFWS)
- 155-acre acquisition at East End Road (Kachemak Bay State Park, AK State Parks)
- 17 ten-acre parcels in Uyak Bay (Kodiak National Wildlife Refuge, USFWS)
- 23-acre Tall Timbers property at Kenai River (ADF&G)
- 17-acre Lowe property at Kenai River (ADF&G)
- 27-acre Grubba property at Kenai River (ADF&G)
- 17 Kodiak properties, including lands at the Karluk and Ayakulik rivers, totaling 260 acres (USFWS, ADF&G)
- 2,825-acre Kennicott property (Wrangell-St. Elias National Park, NPS)

The following acquisitions are in progress:

- 8-acre Mullen property (Kenai River, ADF&G)
- 79-acre Patson property (Kenai River, ADF&G)
- 3-acre Karluk weir (Kodiak, ADF&G)
- 7-acre Fiore property (Kenai River, ADF&G)

All acquisition work done by The Conservation Fund has delivered the properties to the acquiring agencies at or below fair market value, based on agency reviewed and approved appraisals. In fact, the Fund often acquires properties at well below fair market value, resulting in a considerable savings to the agencies.

Leverage

One of The Conservation Fund's greatest strengths is in leveraging our financial resources. In our work on Kodiak Island, we have built an extensive coalition of partners to finance the purchase of small parcels of important habitat. We develop financial partnerships to maximize the leverage of each contributor. So far the Fund has attracted $2 million in private funds and grants to the Kodiak small parcel effort. Highlights of the Kodiak partnership include:

- The acquisition and donation of a 318-acre parcel at Uyak Bay, ranked "high" in EVOS Small Parcel process. This gift from the Richard King Mellon Foundation, valued at $700,000, was the first such conservation donation in Alaska.

- A Challenge Grant of $150,000 from the Orvis Company and Customers.

- Grants of $50,000 from the National Fish and Wildlife Foundation and $437,000 from the North American Wetlands Conservation Council.

- Major contributions from the Kodiak Brown Bear Trust, Wildlife Forever, Anheuser-Busch, the Turner Foundation, and the Weeden Foundation.

The Conservation Fund has the capacity to leverage the *Small Parcel Permanent Fund* with money from private businesses, non-profit groups, foundation grants and government appropriations.

Property Acquisition

The Conservation Fund will coordinate with state and federal agencies to identify acquisition priorities. Much of this work has been completed through the existing EVOS Small Parcel Program. The Conservation Fund will make a deliberate effort to provide parity for state and federal agencies.

The Conservation Fund will appraise, negotiate, and acquire all **properties from willing sellers at or below fair market value, based on agency reviewed and approved appraisals.** With land values in the spill zone exhibiting a wide range, from $500 per acre to $30,000 per acre, $1 million could buy as much as 2,000 acres to as little as 33 acres. But even parcels as small as one acre can be important sites for access, habitat, and management.

Decisions to acquire properties will be based on agency priorities, degree of threat, and financial performance of the *Small Parcel Permanent Fund.* It may be practical to expend less than, or more than, $1 million in any one year. The Conservation Fund's own Revolving Fund can be drawn on to provide loans for expensive or complex acquisitions.

Where possible, The Conservation Fund will pursue conservation easements and explore the possibility of limited development opportunities to stretch the buying power of the *Small Parcel Permanent Fund.* As an example, The Conservation Fund is acquiring the 8-acre Mullen property on the Kenai River for the Alaska Department of Fish and Game. In the transaction, the Mullens are conveying a conservation easement to Kachemak Heritage Land Trust to limit future development of the property. Because of this easement the ADF&G purchase price for the property is reduced by 1/3, saving roughly $50,000 and doubling the habitat protection. In an example of limited development, The Conservation

Fund acquired the important wetland habitat areas of the Tall Timbers property while the owners retained the less-critical areas for homesites.

Financial Management

In partnership with The Conservation Fund, Key Bank will manage the *Small Parcel Permanent Fund*. Key Bank is a leading bank in Alaska, and currently manages a portion of the Alaska Permanent Fund. The investment strategy for the *Small Parcel Permanent Fund* will emphasize protection of the fund principal, with sufficient annual income and growth to fund small parcel acquisitions.

For illustrative purposes only, the attached figures depict the long-term performance of two different portfolios. Both portfolios assume an initial principal of $20 million, a long-term rate of inflation of 3.1%, and annual fees of 50 basis points. The figures project the 20-year performance of these portfolios under different drawdown scenarios of $500,000 and $1 million annually. The presumption is that the drawdown would be used to fund small parcel acquisitions. It is worth noting that the "Fixed Income Portfolio" shows no reduction in principal over a 20-year period while financing the annual expenditure of $500,000 for habitat protection.

The *Small Parcel Permanent Fund* can be managed as a perpetual endowment or it can be set to expire over time. The mandates which govern the *Small Parcel Permanent Fund* will largely determine the selected investment strategy.

Summary

The *Small Parcel Permanent* Fund can provide a long-term source of funding for small parcel acquisition in the spill zone. The Conservation Fund will add value to the *Small Parcel Permanent Fund* in three ways:

1. By acquiring properties below fair market value wherever possible

2. By investing the *Small Parcel Permanent Fund* to produce income and growth

3. By leveraging private funds, grants, and appropriations

The Conservation Fund has the experience, flexibility, and creativity to responsibly manage the *Small Parcel Permanent Fund* as a long-term funding source for habitat protection in the *Exxon Valdez* spill zone.

CONTACT: Brad Meiklejohn, Alaska Representative
The Conservation Fund
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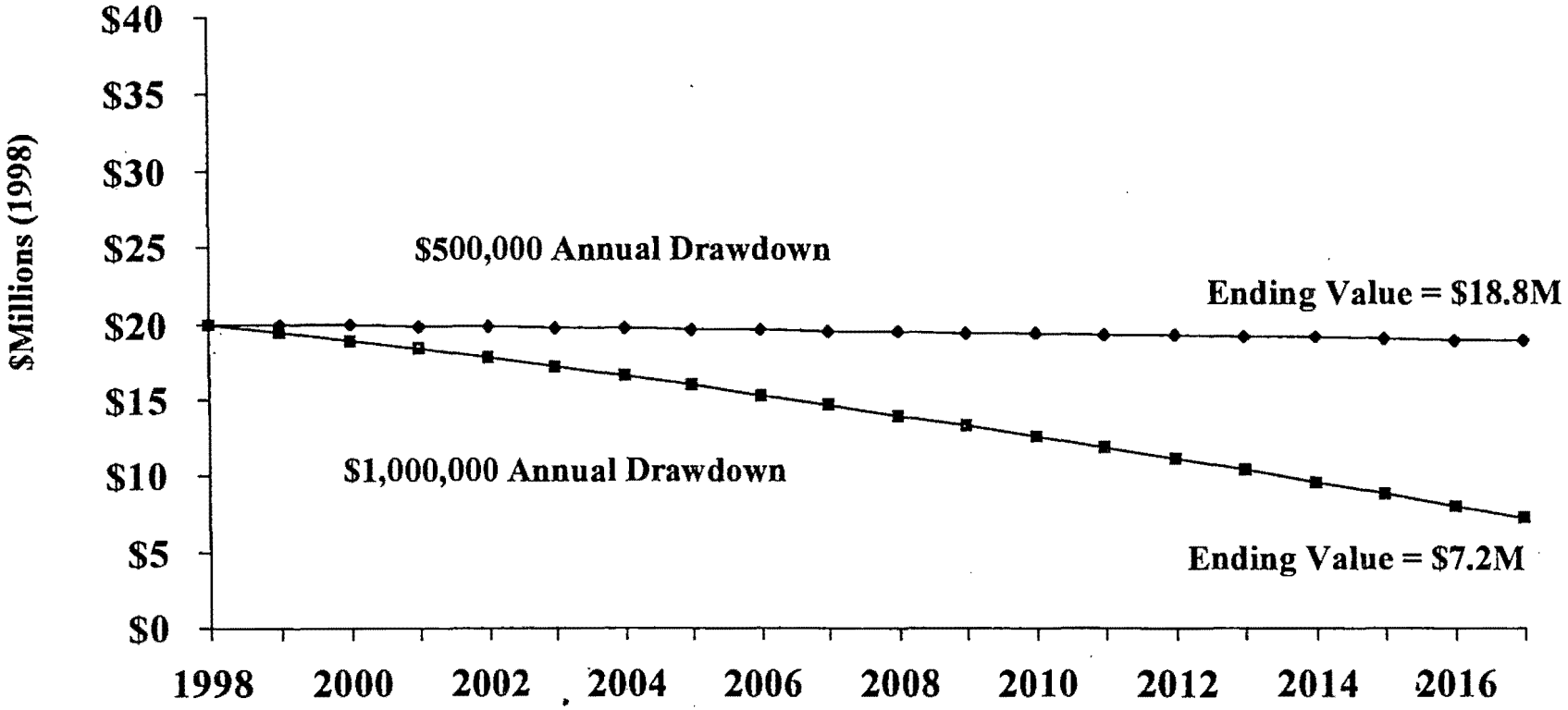
Small Parcel Permanent Fund

Projected Portfolio Values
Fixed Income Portfolio
Expected Return = 5.9% annualized

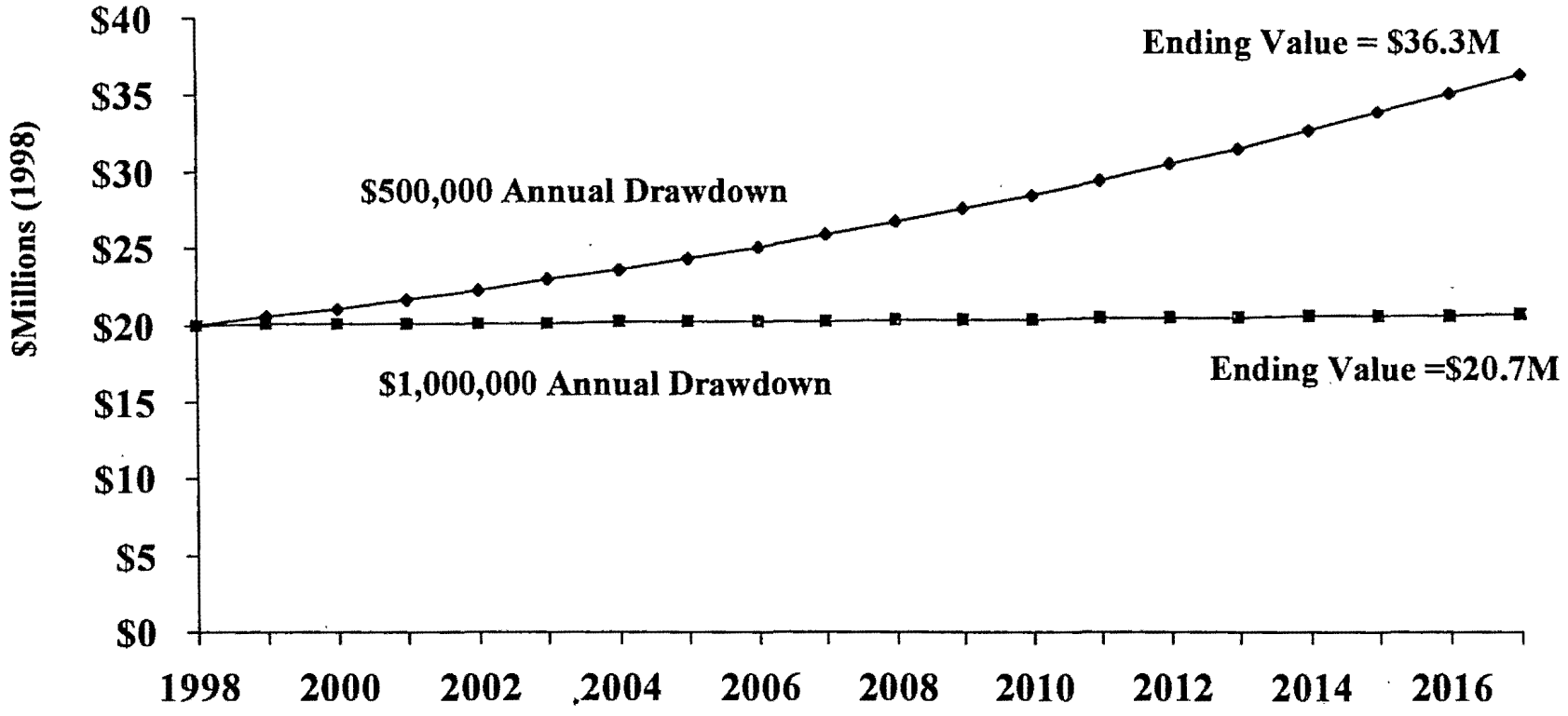


Assumptions: **Inflation =3.1%**
Fees = 50 basis points

Small Parcel Permanent Fund

Projected Portfolio Values
Diversifed Equity & Fixed Income Portfolio

(50% Fixed Income, 15% Convertibles, 20% Large Cap Stock, 15% Small Cap & International)
Expected Return = 8.9% annualized



Assumptions: Inflation =3.1%
Fees = 50 basis points

2653

THE CONSERVATION FUND

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EAGLE RIVER, ALASKA 99577
(907) 694-9060
FAX (907) 694-9070

Ms. Molly McCammon
Executive Director
Exxon Valdez Oil Spill Trustee Council
645 G St., Suite
Anchorage, AK 99503

rec'd 4/30/98

April 27, 1998

Dear Ms. McCammon,

Thank you for the opportunity to comment on the proposed use of the Restoration Reserve. We think the Restoration Reserve is a vital component of the overall restoration plan established by the Trustee Council. The Conservation Fund supports a balanced approach to the use of funds from the Restoration Reserve for habitat acquisition, research and monitoring, and public education.

We believe that habitat protection has been the silver lining of the *Exxon Valdez* oil spill. By implementing the restoration plan, the Trustee Council has done outstanding work to protect some of the finest wildlife habitat in North America, and we are grateful for your commitment to conservation. The large and small parcel acquisition programs have worked as natural complements to produce lasting habitat protection and restoration benefits throughout the spill zone. The Conservation Fund is pleased to have been a partner with the Trustee Council in protecting important lands on Kodiak Island and along the Kenai River.

While the habitat protection effort has produced outstanding results, more work remains. Opportunities to protect important sites will continue to arise throughout the spill zone, and we think there should be a funding source to realize these opportunities in future years. As you know, funding for habitat protection in Alaska is chronically scarce. We think the Trustee Council should set aside a significant portion of the Restoration Reserve for continued habitat protection into the 21st century.

The Conservation Fund endorses the concept of establishing a long-term funding source for habitat protection in the spill zone. Furthermore, we are prepared to manage such a fund or endowment for the acquisition of habitat in accordance with the restoration plan and consent decree. Should the Trustee Council choose to create an account for habitat protection from the Restoration Reserve, we are ready and willing to examine the various available options, in support of the council's decision.

The Conservation Fund believes that an equitable division of the Restoration Reserve includes funding for habitat protection opportunities. Establishing a long-term funding source for habitat protection will extend the conservation impact of the Trustee Council into the 21st century.

Sincerely,

Brad Meiklejohn
Alaska Representative

Alaska

Professional Hunters Association, Inc.

P.O. Box 91932 • Anchorage, Alaksa 99509
(907) 522-3221

September 14, 1999

Exxon Valdez Oil Spill Trustee Council
C/O Molly McCammon
645 G Street, Suite 401
Anchorage, AK 99501-3451

Dear Members of the Exxon Valdez Oil Spill Trustee Council,

This letter is in reference to the proposed land exchange, between the State of Alaska and the Old Harbor Native Corporation, concerning the small section of State Lands on Sitkalidak Island an the Corporation Lands in Kiluda/Shearwater Bay. I would like to offer the industry prospective and support for this proposed exchange.

The exchange takes place in an area that I am personally very familiar with, it happens that Guide Use Area 08-05 (Sitkalidak/Old Harbor) is the area in which I guide.

First and most importantly, this land trade is good for the general public. The State will be trading almost completely inaccessible land at black point, Sitkalidak Island for highly accessible land in Kiluda Bay Immediately reducing the probability of trespass conflicts in both areas.

Secondly from the industry prospective every one benefits by reducing the number of land owners a guide must have land use authorization from, prior to entering the field with his client. The guiding industry in Alaska is controlled by a complicated, multi-layered system of land use authorization and permits.

Currently the State has no way to limit the number of guides who register to operate in a guide use area other than specific hunt permits issued directly to the hunter/client or through requiring land use authorization. Also, the State can not, as of yet refuse land use authorization to a guide on State Land.

The result of the land trade in this respect is that you are increasing the amount of land available to those guides registered to guide in Kiluda Bay, this benefit of added "elbow room" transfers directly to the public, who is the guided hunting client.

As for the State Land on Sitkalidak Island, it is not large enough to support a guiding operation without the land use authorization from Old Harbor for its adjacent lands. Serving then to only attract guides to register for that area who were inclined to trespass during the course of providing services to their client.

Whenever land ownership patterns with guide use areas are consolidated, as in the proposed trade, our industry and the hunting public will benefit. This trade will serve to reduce problems associated with land use regulation and guide use area registration.

Please consider this a letter of support for the Sitkalidak, Kiluda Bay Land Trade. If you would like any further clarification on our position please contact me directly.

Sincerely,

Rob Holt

Rob Holt
President
733-2723

cc: Ms. Marty Rutherford
Deputy Commissioner
Department of Natural Resources
3601 C Street
Anchorage, AK 99503-5947

Rebecca Williams

From: Susan M. Strand [susanmstrand@yahoo.com]
Sent: Monday, October 11, 1999 10:31 AM
To: restoration@oilspill.state.ak.us
Subject: exxon oil spill

I am writing in support of flexible and balanced spending of the Restoration Reserve Fund on nationally significant areas affected by the spill.

=====

Stebbins Tukurngailnguq School
Stebbins, AK 99671
Phone: 907-934-3021

October 7, 1999

Exxon Valdez Oil Spill Trustee Council
645 G St. Suite 401
Anchorage, AK 99501

To Whom It May Concern:

We wanted to thank you for the videos you sent to our school library, "Alutiiq Pride" and " Changing Tides in Tatitlek."
I'm sure they will be informative and interesting to many classes.
Thank you for sharing them with us.

Sincerely yours,

Barbara Dunn

Barbara Dunn, Librarian

Dat.. 8/26/99

Ms. Joan Johnson
2544 29th Ave S
Minneapolis, MN 55406

VALDEZ OIL SPILL
TRUSTEE COUNCIL

Dear: Ms. McCammon

We the undersigned ~~recommend that you~~ support flexible and balanced spending of the Restoration Reserve Fund on nationally significant areas affected by the spill.

This action is a vital addition to the burgeoning movement to restore the earth and its species, whose existence humankind has so shamelessly imperiled.

Thank you for your immediate attention to this matter.

Maxine Klein
James Oestereich
5615 15th Ave S
Minneapolis, MN 55417

Joan Johnson
2544 29th Ave S
Minneapolis, MN 55406

Colleen Meyer
3431 Nicollet Ave S
Minneapolis, MN 55408

Laura and Marcy Rede
3537 16th Ave S
Minneapolis, MN 55407

Mary Monn
2805 McLeod Street
Burnsville, Mn 55337

Lisa Micallef
1544 Twin Springs Rd
Houlton, WI 54082

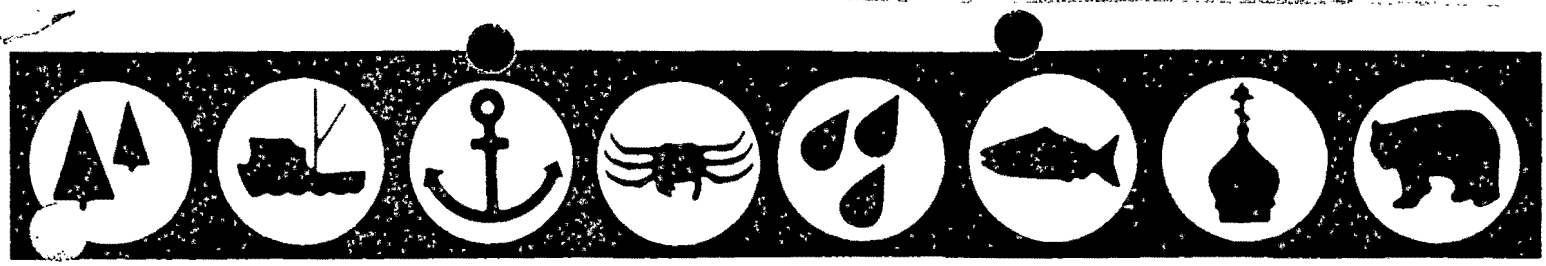
Judi Murphy
1803 Fulham Street
St. Paul, MN 55113

Douglas Flateau
1941 Aldrich Ave S #3
Minneapolis, MN 55403

Sandra McNeal
5042 Nicollet Ave S
Minneapolis, MN 55419

Tina Decker
2845 36th Ave So
Mpls, MN 55406

RECEIVED
AUG 30 1999
EXXON VALDEZ OIL SPILL
TRUSTEE COUNCIL



KODIAK ISLAND BOROUGH SCHOOL DISTRICT
722 Mill Bay Road
Kodiak Alaska 99615

Kodiak Middle School Library
September 27, 1999

Molly McCammon
Exxon Valdez Oil Spill Trustee Council
645 G Street, Suite 401
Anchorage, AK 99501-3451

Dear Ms. McCammon,

Thank you for sending us the two documentaries, "Alutiiq Pride" and "Changing tides in Tatilek". Currently, our IEA (Indian Education Act) staff member is viewing them to see how she can best present them to students.

It takes all parts of a community to educate our children. Thank you for sending us materials to support our curriculum.

Sincerely,

Mary Jane Krajnak

KENAI CENTRAL HIGH SCHOOL

9583 Kenai Spur Hwy. - Kenai, Alaska 99611
(907) 283-7524
FAX (907) 283-3230

September 23, 1999

FYI

Thank

Exxon Valdez Oil Spill Trustee Council
645 G. Street, Suite 401
Anchorage, Alaska 99501-3451

Dear Sirs:

Thank you so much for the videos Alutiiq Pride and Changing Tides in Tatitlek. The Valdez Oil Spill is an important aspect of Alaskan history that needs to be studied and hopefully prevented in the future.

Generous donations or quality curriculum materials such as yours help stretch our budget dollars for our students. This video will be much appreciated by our social studies and science classes.

Thank you for thinking of us.

Sincerely,

Susie Franklin

Susie Franklin
Librarian

HOME OF THE KARDINALS

ANCHORAGE DAILY NEWS
OCTOBER 13, 1999
PG 1 OF 2

FISH PARASITES MAKING SEWARD SEA OTTERS SICK

By JON LITTLE

Daily News Peninsula Bureau

Dying sea otters started showing up at the newly opened Alaska SeaLife Center in Seward about a year ago. In a place with lots to eat, they showed puzzling signs of weakness and stress. Their food, it turned out, was killing them.

Necropsies showed the animals were riddled with parasites. The suspected cause: fish waste at the Seward boat harbor.

Sea otters are well-suited to their usual diet of clams, crabs and sea urchins, but it turns out that their digestive systems can be overwhelmed by parasites found in raw fish, said Pam Tuomi, veterinarian at the SeaLife Center.

Tuomi published a paper in May, describing her discovery that two-thirds of the sick otters brought to the center in its first year were infested with worms and other parasites.

The otter ailment has raised questions about whether the animals are getting into parasite-infested offal from fish-processing plants in Seward and other coastal towns. The SeaLife Center took Tuomi's findings to Seward city officials, prompting the city to modify the way it handles the tons of halibut and salmon carcasses tossed aside by anglers each summer.

The fish waste is collected on four barges at the fish-cleaning stations. Sea gulls would snatch up fish parts and drop uneaten pieces into the harbor, easy pickings for local otters.

Harbormaster Jim Beckham set up rotating yard sprinklers to scare seagulls off. "The sea gulls won't sit on the barge or even get near it with the sprinklers going," he said. Twice a week during the summer, those four barges are towed three miles out to sea and emptied in deep water.

Gulls may not be the only animals dropping fish morsels into the harbor for the opportunistic and habituated otters. It seems an increasing number of people are hand-feeding them, wrongly assuming fish is a natural part of an otter's diet.

Angie Doroff, a federal biologist leading sea otter research in Alaska, said Seward is ripe for a public awareness campaign asking people simply to leave the animals alone. Such efforts have worked well in California, where sea otter populations are low, she said.

"Alaska is changing dramatically," said Doroff, who is with the U.S. Fish and Wildlife Service. "We're having so many more near-shore interactions" between people and wildlife. "There's been a tremendous change in the last decade."

To nail down the cause of the problem for sure, the Fish and Wildlife Service is working with the EPA to learn how much waste fish plants produce, what kinds of fish are dumped and what times of year Alaska's fish plants operate, Doroff said. "There's still a lot of unknowns," she said.

The chief culprit in the eight or so sea otter deaths chronicled by Tuomi are called anisakidinae, or round worms. Fish and some fish-eating animals can live with round worms. But if otters eat too much fish and get too many worms, it can kill the weak and the old. The larvae burrow into the stomach wall, actually cutting holes in it. And the otters die slowly of hypothermia and other complications.

Scientists have recorded other episodes where groups of otters died from a combination of starvation and round worm infestation, she said. Often that occurs when they run out of shellfish and start eating whatever else they can find.

In Seward, though, it's more likely the lure of a free lunch than a shortage of shellfish, Doroff said. Most of the deaths

were among young or old otters. "If we're seeing animals in their reproductive prime showing up dead, or in the harbor, then we would be concerned."

Seward harbor may not be the only one tempting otters with potentially fatal fish snacks, Tuomi said. "I think this is probably happening in Homer, Kodiak and Valdez, any place where there's large numbers of fish carcasses being shoved over the docks," she said.

The region's sea otter population is considered pretty healthy, although otters in Prince William Sound still haven't recovered fully from the 1989 Exxon Valdez oil spill, Doroff said.

* Reporter Jon Little can be reached at jlittle@adn.com

*

TRACKING HARVEST ON-LINE
Web site offers subsistence data

By NATALIE PHILLIPS
Daily News reporter

Wondering what subsistence foods appear to be tainted or where in Alaska salmon are showing up deformed with one eye and tumors? Want to know what changes Native hunters in Kotzebue are observing in the ice pack or about the nutritional value of cloudberries dipped in seal oil?

Some of the answers can be found on a web site unveiled last month at a science conference in Denali National Park and Preserve.

The interactive data base blends observations from the field by Native subsistence hunters, contaminant research by scientists and health officials, and government data on subsistence harvests.

"There's nothing else quite like it," said Patricia Cochran, executive director of the Alaska Native Science Commission. "We've put together a really unique blend of science and traditional knowledge."

The work took three years and was done by the science commission and the University of Alaska Anchorage's Institute of Social and Economic Research, funded with $300,000 from the Environmental Protection Agency. The data base is built to be expanded as new research or additional sources of information become available.

The program was made available on-line just within the past few weeks, so it's too early to measure the reaction, said Cochran, who is scheduled to spend much of next year demonstrating the data base around the state and the circumpolar region.

"It's designed for use for both the Native community as well as researchers and scientists," she said.

The project got started when EPA officials in Seattle realized that they were getting repeated questions about the safety of Alaska Native subsistence foods. The EPA contacted ISER and asked if it could survey the existing reports and literature about subsistence foods and contaminants.

"I said, instead of a written report, what if we did a data base that we could add to," said Jack Kruse, a project director with ISER.

The first step was to round up studies that had been done over

the years in Alaska's far-flung places. It turned out there were few, and the results of those studies were either inconclusive or else they merely identified the presence of lesions or other abnormalities on some fish and wildlife, without saying if they pose a danger to humans.

Step two involved traveling to communities statewide and talking to locals about their observations about changes in weather patterns and subsistence foods. Their observations were documented and added to the data base. They can be called up based on species, location or type of ailment.

For example, in Kotzebue, Enoch Scheidt reported that salmon were showing up with pus inside them and that the collars that scientists put on caribou were rubbing the caribous' necks raw. Eric Iyapana from Little Diomede reported that the taste of local plants has changed and that the fur on seals is coming off as if they are molting when it is not molting season.

The goals of the project are to allay subsistence users' health fears, to direct researchers to specific issues that are a priority to people dependent on subsistence foods and to get information to Native tribes so they can make their own decisions about the safety and nutrition of their food.

Despite gaps, there is a wealth of information in the data base. One can find, for instance, that a small serving of agutuk - cloudberries with seal oil - provides 1.8 grams of protein, 22.9 grams of carbohydrate and 2.3 grams of fiber. Clicking another direction through the web site, one finds the levels of organic chlorine compounds, a persistent pollutant, in beluga blubber in Point Hope or the mercury levels in the liver of bowhead whales harvested in Barrow or other heavy metal contamination found in fur seals at St. Paul.

"It's far from complete," Kruse said. "We're hoping people with data on contaminants will see that it is worthwhile to get their information into the data base."

Eventually, ISER's role in the project will diminish, Kruse said, and the data base will most likely fall into the hands of the Alaska Native Science Commission to maintain.

The web site is at http://137.229.112.63/katie/contamjul/db/.

q Reporter Natalie Phillips can be reached at 257-4461 or nphillips@adn.com.

ANCHORAGE DAILY NEWS
OCTOBER 7, 1999

TEXAS VET TAKES OVER AS DIRECTOR AT SEALIFE CENTER

The Associated Press

KENAI - The Alaska SeaLife Center in Seward has hired a Texas veterinarian as its new director.

Mark Lloyd, formerly at the El Paso Zoo, assumed the post last week and already has specific plans for improvements. He acknowledges that managing the facility and improving its cash flow will be major tasks.

"I always go out on limbs and bite off a lot. I tend to be a bit of a workaholic," he said. "That's because I love what I do."

The center is aggressively pursuing grant funding. Most of the grants deal with education, some with research and a few with animal husbandry. It is also working with Alaska's congressional delegation to find federal money to pay off its $17.5 million construction debt.

The center, a combination cold-water marine research facility, sea life aquarium and rehabilitation center, opened 11/2 years ago.

Lloyd said he intends to take an active role in expanding the center's marketing and development efforts, including personal outreach to groups around the state.

After a discussion during one of his three job interviews, he sent a letter to the board of directors urging the center to continue treating injured and orphaned wildlife. Last spring, the board had issued a revised business plan stating that the rehabilitation program had lost $1 million and should be suspended until the center developed an endowment to underwrite it.

Rehabilitation has indirect value, Lloyd said, and he is personally committed to it. Releasing successfully rehabilitated animals, such as the two young harbor seals that were returned to the wild recently, helps people appreciate what the SeaLife Center does.

"That kind of publicity yields intangible and long-lasting rewards," he said. "I think when (people) pay their money at the door, they are glad we are doing these other things."

Lloyd's background includes work as a manager and exotic-animal veterinarian at several zoos and aquariums. He is the third director for the $56 million facility, replacing biologist Kim Sundberg.

ANCHORAGE DAILY NEWS
SEPTEMBER 28, 1999

The Anchorage Times

Publisher: BILL J. ALLEN
"Believing in Alaskans, putting Alaska first"
Editors: DENNIS FRADLEY, PAUL JENKINS, WILLIAM J. TOBIN

The Anchorage Times Commentary in this segment of the *Anchorage Daily News* does not represent the views of the *Daily News*. It is written and published under an agreement with former owners of *The Times*, in the interests of preserving a diversity of viewpoints in the community.

Watchdog Don

CONGRESSMAN Don Young minced no words the other day in criticizing federal agencies that have hampered, delayed and otherwise obstructed implementation of certain provisions of the Alaska Native Claims Settlement Act.

He was particularly sharp in what he had to say about the Exxon Valdez Oil Spill Trustee Council.

The government, through the council, he said, "is engaged in a campaign to eradicate private Native ownership of land in Southcentral Alaska.

Speaking at a meeting of the House Resources Committee, as he won approval for a bill that would give the Chugach Alaska Native Corp. access to to traditional land and ancient burial sites in the Chugach National Forest, Young said:

"In its zeal, the council has bought sacred Native burial sites, religious buildings and historic places. While village corporations and private entities sold the lands containing these sites, ANCSA intended that regional corporations acquire them if the others did not want them. Chugach is adamant that these sacred sites belong in Native — not government — hands."

House committee approval of the bill comes in the face of threats by the Clinton-Gore administration to veto the measure if it passes the full Congress. Of course. National environmental organizations don't want anybody to have access across the lands — not even the Natives who have historic rights in the area.

AT ISSUE HERE is a 73,000-acre tract within the Chugach National Forest. Despite provisions of the settlement act, the U.S. Forest Service, abetted in recent years by the Exxon spill council, has worked diligently to deny access to the land and to flim-flam the transfer of traditional title into government hands.

After fighting for 28 years to try to get access, it's no wonder that some village corporations took payments in lieu of land. The government, with unlimited legal staffs and an abundance of bureaucratic rules and regulations, can be a difficult monster to battle.

Rep. Young, chairman of the Resources committee, is seeking here a direct assault on the these forces. Senior Democratic members on his committee were opposed, standing with the environmental lobbies, with President Clinton, and with his hand-picked choice of a successor, Vice President Gore.

Alaska Natives might want to remember who their enemies are when election time rolls around next year.

Understanding science through Native ways of learning

The American Indian Science and Engineering Society (AISES) is a professional organization of American Indians and Alaskan Natives. For over nine years AISES has sponsored summer programs throughout the United States that have empowered Indigenous students to increase their academic abilities, preparing them for careers in science, mathematics, and technology.

Last year AISES expanded its efforts to our students in Kodiak and combined resources with the Alaska Rural Systemic Initiative, Kodiak Island Borough School District, Kodiak Area Native Association, and the Afognak Native Corporation to provide a fantastic, academically challenging and culturally enriching experience for students, teachers, community members, and Elders.

This opportunity was, once again offered this summer during two, one week camps, July 18-24 and July 25-31 at the "Dig Afognak" site on Katenai Afognak Island. The camp was open to all students currently

MOMENT OF REST — Kodiak Island elders (left to right) Dennis Knagin, Kathryn Chichenoff Julie Knagin, Nadia Mullan and Mary Haakanson participated in this year's Academy of Elders AISES Science Camp. Throughout the week they inspired, taught, shared and laughed with other participants while exploring Alutiiq language, stories and Native ways of knowing.

(Otto Mahle photo

living among the Kodiak Archipelago with an interest in Alutiiq Native culture, language and ways of knowing, as well as science, math, and/or technology. It was advertised through a variety of means including school and classroom newsletters, KANA, Native corporations and Tribal Councils, as well as through presentations to classes of students, KIBSD school board, and teacher in service.

Also invited were the Alutiiq Academy of Elders, educators of the Kodiak Island Borough School District, members of the Native Educators of the Alutiiq Region and, other interested community members. Communities from around the island were represented including Karluk, Port Lions, Ouzinkie, Larsen Bay, Kodiak and Old Harbor.

This summer a total of 55 people participated in the Academy of Elders/AISES Science Camp. This included 10 Elders and community members, 34 students, 9 teachers, 2 representatives from KANA and an *additional 7* staff members of "Dig Afognak."

Though sometimes seen as "Dig Afognak" itself, this camp has a separate, but compatible purpose as the Native Village of Afognak's program using archaeology as a way to teach and connect its tribal members and visitors with the Alutiiq culture of the past. The Academy of Elders/AISES Science Camp hopes to acknowledge the Alutiiq Elders as the first teachers of their Native culture and allow for its participants to learn first hand from them and other community members.

While at camp children work side by side with Elders and others to explore and apply Native values and perspectives with western math, science and technology. Students not only learn about the rich history of our island communities but also explore current issues affecting rural survival and Native life.

The camp uses the environment that our children are most accustomed to: our islands, the ocean, the plants, the animals and the values of our Elders.

See SCIENCE CAMP, Page 7

HOOKED — Trenton and Willie Nelson, from Port Lions, discuss their next step to answer their questions regarding traditional halibut hooks. The boys were successful in collecting the materials, designing and creating their hooks with the help of many of the adults at camp.

(Photo courtesy of Kodiak Island Borough School District)

KODIAK DAILY MIRROR
9/17/99 PG 3

Science camp

Continued from Page 6

We may not think of our Native culture and subsistence ways as science, but what our Elders and others who live the Native life have taught us about our environment, the animals, the weather, and their technology and ingenuity is scientific!

Each student comes to camp with a "Big Question." While at Katenai, participants explore and gather background information pertaining to their curiosity. After preparing a hypothesis, an experiment is designed with the help of teachers, and students keep a journal of information gathered. With the help from Sabrina Sutton (a KIBSD teacher), laptop computers provided by the University of Alaska Fairbanks and a printer from the IBM Corporation, students are able to completely document their work and leave camp with either a completed science project or a framework to use for continued research.

Students are expected to participate in the 2nd Annual Rural Science Fair to be held this fall, hosted by the community of Ouzinkie. High achievers from that fair will be invited to go and compete in a statewide "Native Ways of Knowing" science fair, then, perhaps to the AISES National Science Fair in Albuquerque, New Mexico in the spring.

Last year three students originally from Old Harbor competed in the AISES Nationals. One student, Kelsey Peterson, won the "Traditional" award for her work regarding the technology behind the gut skin waterproof stitching technique used by her Aluting ancestors.

BASKETRY — Helen Dick, an Athabascan basket maker from Lime Village, teaches Kodiak elder Kathryn Chichenoff the skill of making a birch bark basket. Helen attended the camp as a volunteer along with her husband, Alan, who is a "village science" teacher working for the Alaska Rural Systemic Initiative. (Sven Haakanson Jr. photo)

STUDYING THE TIDE — Arthur May, a sixth-grade student from Port Lions, guest science teacher Alan Dick, and Ouzinkie teacher Jerry Sheehan raise a pole to be used as an aid for Arthur to observe the rhythm of the tide throughout the week at camp. (Scott Christian photo)

NATURAL COLORS — Brenda Schwantes, KANA's education administrator, led an activity that allowed students to "discover" various colors that can be made from natural material. Students Chantel Aga, from Larsen Bay, Valen Bishop, from Kodiak, and Andrea Knowles, from Larsen Bay, make paint from crushed blue mussel shells (Teri Schneider photo)

Homer News
September 16, 1999
pg 1

Inlet safety needs cited

by Tim Moffatt
Staff Writer

A decade after the devastating Exxon Valdez oil spill in Prince William Sound, the Cook Inlet Regional Citizens Advisory Council is still struggling to find ways to make tanker traffic safer and prevent another disaster like the 1989 grounding on Bligh Reef.

Members of CIRCAC and others involved in petroleum transportation convened in Homer last week in a forum called "The Safety of Navigation in Cook Inlet," a two-day meeting at the Homer Elks Club.

See FORUM, Page 7

. . . Forum participants find plenty to disagree on

FROM PAGE ONE

Several interest groups with differing views offered their views on how best to improve navigational safety to prevent a spill, but came to no consensus.

Much has been done to prevent another disaster in Prince William Sound, but many of the features of vessel safety developed there have yet to be implemented in Cook Inlet. If an oil tanker in Cook Inlet is in distress, it likely will head for Kachemak Bay, the de facto "port of refuge" for the region. If it is on fire, there is no firefighting vessel available to assist. And if it has lost power or steering, there is no response vessel here capable of helping it maneuver to safety.

Pilots dock vessels in Nikiski without assist tugs, there is no Vessel Traffic System to track ships in the inlet, and even minor navigational aids such as a range light for the Nikiski area have yet to be installed.

If a major spill occurs in the upper Inlet, Cook Inlet Spill Prevention and Response Inc., an industry cooperative created in the wake of the 1989 Exxon Valdez oil spill, has 80,000 gallons of storage capacity and 18 miles of containment boom waiting to aid in response.

But the Exxon Valdez spill was more than 11 million gallons, and CISPRI General Manager Doug Lentsch conceded that containment boom during ice conditions would merely float around with the ice, while the radical tides and complex currents of the Inlet could take the oil beneath the surface and elude any containment effort.

Bob Sha[illegible]son

"Navigational safety in Cook Inlet is an oxymoron," Bob Shavelson of the environmental monitoring group Cook Inlet Keeper told the group during opening remarks Friday afternoon. He called for tug assists to escort tankers in the Inlet.

He said the oil industry has "skated for many years" by not providing tug assists, and suggested the cost of tugs could be spread across crude oil and non-crude commodity carriers.

Shavelson also called for better vessel tracking in the Inlet, vessel traffic lanes and winter ice rules for navigation, adding that during extreme icing conditions, only double-hull tankers should be allowed in Cook Inlet. "Cook Inlet is a notoriously tough body of water," he said.

Ed Murphy of the Southwest Alaska Pilots Association took the opposite view, saying vessel traffic lanes would be counterproductive because they would create conflicts with commercial fishing vessels. Informal vessel traffic lanes already exist, he said, giving ships flexibility in navigating around the commercial fishing fleet.

He also dissented from Shavelson's call for tug assists, which was echoed by other speakers during the forum. "I am perplexed about the cry for tug assists," Murphy said. "We have been docking vessels at Nikiski for the past 30 years without tug assists."

He proposed a couple of technical improvements to navigation, including resurveying the bottom of Cook Inlet and adding a range light for the approach to the Nikiski dock. Murphy expressed concern that the National Oceanographic an[illegible] Atmospheric Administration is subcontracting some of its survey work, and "frankly, they're not as good" as the NOAA-produced surveys, he said.

Murphy added that commercial ship pilots don't "have an enormous amount of faith in vessel traffic systems," commenting that a similar system in Prince William Sound in 1989 "watched the Exxon Valdez run aground." A Vessel Traffic System is a radar-based system somewhat like air traffic control that tracks the locations of vessels in a waterway.

Efforts to place a range light have been thwarted by a landowner who refuses to have the light located on his property, according to Murphy.

Sen. Drue Pearce, R-Anchorage, told the gathering she was pleased that the discussion was focused "on the issues, not personalities," but warned that there is no consensus on what is needed in Cook Inlet. She believes data, not opinions, are necessary.

"Getting together and stating your views isn't going to make (navigational safety) happen," Pearce said. "Until you have a comprehensive risk analysis, it will be very difficult to get what you want."

The board of CIRCAC is meeting tomorrow in Kenai, and according to spokesman Joe Gallagher, it will consider developing a risk analysis. At this point, there is no estimate of what such a study would cost or how long it would take to perform, Gallagher said.

The U.S. Coast Guard did a "Port Needs Study" of the need for vessel tracking system in 1991. It placed Cook Inlet far down on a priority list of ports on the Atlantic and Pacific coasts. The cost-benefit study concluded that the costs of installing a VTS – a radar system to track vessels as is used in Prince William Sound — in Cook Inlet would outweigh the benefits to the tune of a negative $14 million, putting Cook Inlet second from the bottom of the list of 23 ports nationwide.

What was wanted for Cook Inlet depended on who was speaking at the time.

Sen. Drue Pearce

Shavelson supported the idea of having escort tugs in the Inlet, but Pearce dismissed that, calling the tugs "big toys."

If there was consensus on any issue, it was that a port authority would be a positive addition to the matrix of marine safety measures on Cook Inlet. A port authority would be able to issue bonds for improvements and tax waterway users.

The legislature has approved what CIRCAC Executive Director James Carter calls "complicated" laws providing for the creation of a regional port authority, but implementation of an authority would require complete agreement among regional governments and ports, both to create a Cook Inlet Port Authority and to determine its scope of powers and responsibilities.

Many spoke of the needs, but few during the meeting expressed the stakes the group was playing for as eloquently as Patrick Norman of Port Graham Village Corp. "Our village economy is based on fishing three months of the year. An uncontrolled spill would have a devastating effect on us. The experience of 10 years ago still dwells with us," he said.

Sally Ash of Nanwalek IRA Council agreed. Her people "depend on Cook Inlet for their livelihood," she said. "A major spill would put a greater burden [illegible] the government to take care of us."

The Peninsula Clarion
September 14, 1999

In the news

Sharks becoming nuisance to fishers

CORDOVA (AP) — Bill Vebber Jr. had to cut short a good 48-hour opener a few weeks ago after salmon sharks cut huge holes in his gillnet.

Salmon sharks have become a common sight in Prince William Sound and a major nuisance to commercial fishermen like Vebber, from Cordova, who often have to pay as much as $1,200 to replace their gillnets. The predators also have caught the eye of a group of scientists who were spending part of their summer studying birds and fish in the Sound.

Salmon shark habitat extends from the Gulf of Alaska to the Oregon coast. They can grow to 12 feet although those in the Sound are averaging 6- to 7 feet.

Kodiak Daily Mirro
Septmeber 13, 1999

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The predators also have caught the eye of a group of scientists who were spending part of their summer studying birds and fish in the Sound.

Members of the Alaska Predator Ecosystem Experiment decided to add salmon sharks to their list of fish being studied when they became a common bycatch while researchers were sampling juvenile herring.

Salmon shark habitat extends from the Gulf of Alaska to the Oregon coast. They can grow to 12 feet although those in the Sound average 6- to 7 feet.

Salmon sharks can eat almost anything, but they appear to follow salmon runs and prey on squid, pollock, rockfish and herring.

Oil spill trustee council approves $7.3 million to fund 63 projects

By the Journal Staff

ENVIRONMENT

The Exxon Valdez Oil Spill Trustee Council in August approved $7.3 million to fund 63 research, monitoring and general restoration projects in the Kodiak Island, Kenai Peninsula and Prince William Sound regions. The council received 133 proposals for $16.4 million in funding.

In December, the council will consider funding $1.8 million for 17 projects.

The approved fiscal 2000 projects include:

• At Prince William Sound, up to $240,000 for herring research; $833,000 to study pink salmon; $598,000 for oceanographic and ecosystem work; $835,000 for harbor seal and killer whale studies and $2.2 million for studies on seabirds and the fish on which they prey.

• $122,000 to the Chugach School District to fund Youth Area Watch, a program for Prince William Sound and lower Cook Inlet students' work in restoration science.

• $62,000 for a similar program with the Kodiak Island Borough School District.

• On the Kenai Peninsula, $75,000 to enhance pink salmon returns to Port Graham; $46,000 to evaluate efforts to increase spawning habitat in Port Dick Creek. Eight research projects, totaling $1.6 million and studying pink salmon, pigeon guillemots, harbor seals and surf scoters, are funded at the Alaska SeaLife Center in Seward.

• In the western part of the spill area, the council is funding enhancement of the coho run in the Kametolook River near Perryville on the Alaska Peninsula. Village-based technicians will be trained to take samples from harbor seals for use by researchers. The council has granted $55,600 for development of a rapid screening test that can detect paralytic shellfish poisoning and other natural toxins in shellfish collected for subsistence and personal use.

A Clear-Cut Case Spurs Debate About Tribal Land Practices

* * *

Tatitleks Cashed In on Timber, But Some Now Lament A Wilderness of Stumps

By JIM CARLTON
Staff Reporter of THE WALL STREET JOURNAL

TATITLEK, Alaska – This tiny village of native Alaskans sits on a glistening inlet of Prince William Sound, backed by a jagged, tree-blanketed peak. What damage remains from the nearby Exxon Valdez oil spill 10 years ago is hard to see.

Just to the east, the vista is impressive for other reasons. A larger bay is ringed with broad splotches of ugly clear-cuts. The Tatitlek tribe sold the timber rights here in 1986, and heavy logging in the years since has left scars that environmentalists say will take far longer to heal than any left by the infamous spill itself.

Since the 1980s, scientists estimate as much as 400,000 acres of virgin forest on Alaskan native lands—an area about half the size of Rhode Island—have been clear-cut. The logging was fueled by partnerships between two-dozen for-profit Alaska Native American corporations eager to convert some of their natural resources into cash and timber companies seeking refuge from tightened restrictions on federal land.

Tax Cuts

The logging generated hundreds of millions of dollars for the timber companies and the tribes. The tribes often sold their timber rights at prices below market value to generate lucrative tax benefits, which they in turn peddled to corporations looking to trim their tax bills. But the resulting wilderness of stumps has angered many local residents and raised questions about tribal stewardship of ancestral lands.

"We European immigrants certainly did a lot of injustices to tribes in usurping their lands, but it is an open question whether their management of the land will be better or worse," says Dan Loss, an environmental professor at Lewis and Clark College in Portland, Ore.

The notion of indigenous peoples' reverence for nature is deeply ingrained in both tribal belief systems and American popular culture. But as tribes, many newly flush with casino cash, press claims for more land and more control over their resources, fresh debates are bubbling up about whether native land practices are more environmentally friendly than anyone else's.

Roadside Distractions

On Washington's Olympic Peninsula, the Quinault tribe has razed lush fir and hemlock forests along one stretch of heavily trafficked U.S. Highway 101, angering some government officials. "They scalped the land," fumes Interior Secretary Bruce Babbitt. Oregon's Confederated Tribes of Warm Springs opened their 330,000-acre forest to such heavy cutting in the early 1990s that they recently opened a casino to compensate for a sharp drop in logging profits caused by a dwindling tree supply.

Native Americans acknowledge some environmental mistakes, but say any excesses stem from understandable efforts to escape reservations' crushing poverty. Others argue that the problems are a sign of further erosion of tribal traditions. "I don't think many of us would want to cut down a forest, but what's happening is the money value system is spreading everywhere," says George Horse Capture, a member of the A-aninin Gros Ventretribe

Please Turn to Page A4, Column 1

Clear-Cut Case Spurs Tribal Land Debate

Continued From First Page

a deputy director of the National Museum of the American Indian.

Money was certainly the root of the logging on Tatitlek and other native Alaskan lands—and indeed, money, from an unusual source, was the best hope to stop it. Shortly after the Exxon Valdez spill in 1989, regulators and environmentalists came up with a plan to use oil-spill settlement funds to buy back timber. And $400 million in settlement funds has been spent to buy back 640,000 acres of forest. But the deals took so long to arrange—up to eight years—that miles of trees fell before they could be bought.

Gary Kompkoff

The Tatitlek first signed a logging deal in 1... the year Congress amended the tax code to allow loss-plagued native corporations to sell their net operating losses to outside companies, which could use them to trim their tax bills. The move had perverse consequences: Native corporations sold vast tracts of timber, often at prices distorted to maximize tax benefits. Logging exploded. In 1989, when Congress closed the loophole, almost half the choice native forest in southeast Alaska had been clear-cut.

Also fueling demand for native timber were tighter federal environmental restrictions that caused logging in Alaska's 16-million-acre Tongass National Forest to drop off, starting in the late 1980s. Logging and other resource extraction is less strictly regulated on Indian lands. For instance, the size of clear-cuts—a technique in which every tree in a logging area is razed—is limited on federal and much state land; in Alaska, there are clear-cuts 25 miles long on some native land.

In one deal, the Tatitleks sold the timber on about 10,000 acres along one side of an inlet to the east, Port Fidalgo, for $400,000. The buyer was another native corporation, called Chugach Alaska, which formed a joint venture to run a logging operation mainly for Citifor Inc., a Seattle-based timber firm. The price was low, timber experts say, but generated a tax loss that the Tatitleks also sold for another $2 million or so. As the rest of the world focused on the Exxon Valdez spill in 1989, Tatitlek trees began to fall.

The Fidalgo estuary harbors prime habitat for animals ranging from salmon to grizzly bear to wolf. Citifor bulldozed more than 50 miles of logging roads and set up a work camp that employed 100 people, many from Tatitlek.

The company, which was logging on native lands freed from many regulations, opted to clear-cut, rather than to log selectively, or to thin out stands. "From a practical point, clear-cutting is the only way you could harvest that much timber," says Bob Rice, then a Citifor vice president.

Unlike many of the big clear-cuts that appeared around the sound on other tribes' acreage, the Tatitlek logging initially drew little outside attention. It was largely out of sight. By 1995, though, Citifor planned to expand to a nearby peninsula visible from Tatitlek. Tribal leaders felt more strongly about protecting their home inlet than Port Fidalgo, even though they had sold the timber rights to Citifor.

"That was going to be right in our backyard," says village president Gary Kompkoff.

In 1995, the Tatitleks figured there might be a way out that would bring in even more money. They began eyeing the Exxon Valdez spill settlement funds, which after years of false starts had begun to be used to buy native timber rights. "In one of our meetings after that, Gary looked at me and said, 'Save us from ourselves,' " recalls Molly McCammon, executive director of the Exxon Valdez Oil Spill Trustee Council, which oversees expenditure of the spill money. "He said, 'This is our land and we don't want to log.' " (Mr. Kompkoff says he doesn't recall saying that.)

But the bureaucratic council moved more slowly than the chainsaw, and the Tatitleks' case was complicated by the fact that they had already sold most of their timber rights to third parties. The tribe spent months negotiating a complex deal to regain ti... for resale. Meanwhile, more Tatitlek trees fell. Citifor eventually was paid about $6 million and got access to land elsewhere. Last year, the council paid the tribe $34.5 million for the rights to 70,000 acres.

"Life has improved substantially," Mr. Kompkoff says. "We're getting paid not to cut trees we didn't want to cut in the first place."

After $25 million was set aside for a tribal trust fund, the 200 or so Tatitlek shareholders got windfalls averaging about $50,000. Villagers have taken Hawaiian vacations and bought new trucks and TV satellite dishes.

Sue Johnson used her money to open Tatitlek's first cafe: a burger stand she operates from a van. It's a landmark in the mile-long village, along with the blue Russian Orthodox Church, the blue community center and a blue medical center, evidence of donated paint.

"I couldn't have done this without the settlement," Ms. Johnson says as she flips burgers for schoolchildren, who, like their parents, have mixed views on the village's timber legacy. "I'll be old and gray before those trees grow back," sighs 16-year-old Daniel Vlasoff. Angela Totemoff, 17, retorts: "It gave us lots of jobs."

In all, the spill council manage... ...ck away more than 640,000 acres in the region. Still, about 100,000 acres of virgin forest in the Prince William Sound area were lost to native clear-cuts, environmentalists estimate.

And the logging threat is far from over. About 50,000 acres of native timber around the sound remain unprotected, as do huge tracts elsewhere in the state. The Chugach corporation wants to carve a logging road through the Copper River delta, the largest Pacific wetlands in North America, and plans to develop its 242,000 timbered acres.

"If we want to pursue our ability to build roads or cut timber, obviously we're going to do it," says Sheri Buretta, head of the corporation, which has 2,000 tribal members. "We're a business."

Point of View

Consistency needed in decisions on fish rearing

by Paul McCollum

I just wanted to say thanks for the article that covered the Port Graham Hatchery's request to the Alaska Department of Fish and Game to potentially use hatchery broodstock from the Tutka Bay Hatchery. A couple points need to be clarified, however, especially regarding the editorial run in the same issue.

First off, when it looked as though the Port Graham River was going to get less than 1,000 fish for escapement, we requested that ADFG authorize Cook Inlet Aquaculture Association to take extra eggs from what appeared to be an excess number of hatchery broodstock. We simply did not want to miss the window of opportunity and wanted to see if Fish and Game would allow the Tutka Hatchery to take those eggs before the fish disappeared. We then would have had a few months to go over Fish and Game's concerns regarding actually transporting these eggs to the Port Graham Hatchery.

I was disappointed in some of the misconceptions and lack of factual information you presented in your editorial. You associated Alaska's private nonprofit (PNP) hatchery programs with "salmon farming" done elsewhere that is strictly prohibited in Alaska.

The Alaska PNP program is mandated by law to use randomly selected broodstock that are in no way selected for specific characteristics. With pink salmon especially, because there are large numbers of brood fish used, there is virtually no difference in the genetic makeup of those fish from the brood source they originated from.

This type of inaccurate information ends up promoting this type of misinformation that Alaska hatchery fish are some type of genetic misfits. Your statement, "The matter at stake here is virtually the same reason that the farming of salmon in Alaska is prohibited," as well as the entire paragraph that followed was both false and misleading. Your opinion that the state's decision is not surprising and was the right decision appears to be based on your lack of understanding of the facts. If the situation was anything as close to as straightforward as your editorial suggested, then most of the enhancement projects in Alaska would not be allowed.

Your editorial implied that these fish were going to be put directly into the Port Graham River to mix directly with the wild fish there. This is simply not the case. The Tutka Hatchery eggs and the resulting fry would have been released at the Port Graham Hatchery where the returning adults would come back, not the Port Graham River. There is no question that a few of those fish would stray further up the bay and mix with the wild stock there, but it would be very low numbers since most would be harvested or collected at the hatchery.

There is just as much data that would suggest that a few Tutka fish mixed in with a much larger number of the Port Graham River stock would be a healthy thing as data that might suggest otherwise.

Pink salmon stray quite a bit and it is very likely that some returning Tutka Hatchery fish stray into Port Graham River every year due to the large numbers heading up into Kachemak Bay. Genetic diversity is very likely one of the reasons pink salmon are such a productive and prolific species. There is just as much data that would suggest that a few Tutka fish mixed in with a much larger number of the Port Graham River stock would be a healthy thing as data that might suggest otherwise.

My final point is one of fair play. The other enhancement programs in Southcentral Alaska are of course generated from fish from other stocks and other hatcheries. Nearby we have original sources of Crooked Creek kings or Bear Creek (Seward) coho that are or were going to the Fort Richardson Hatchery and then released in Halibut Cove, the Fishing Hole and Fritz Creek. The Tutka Hatchery pink salmon stock came from Port Dick and Tutka Creek. Fish and Game authorized the use of the resulting Tutka Hatchery stock to be released in Paint River across the Inlet along with some sockeye as well. Leisure Lake and Hazel Lake sockeye are from Tustumena Lake after incubation and rearing in the Fort Richardson Hatchery. Chenik Lake sockeye are stocked from the Crooked Creek Hatchery stock.

So many enhancement projects all over the state have occurred in the past or are still going on that have much more questionable fish transports or stock relocations than this would have been. Many hatcheries have used broodstock from other hatcheries, all of which were much farther away than Tutka Lagoon Hatchery is from Port Graham. This does not mean that these other transports were wrong, it just points out that there is a lot of subjective reasoning involved in issues like this.

It would be nice if Fish and Game had more consistent and straightforward criteria for determining acceptable vs. non-acceptable projects and or proposed fish transports permits. It makes it more difficult for hatchery operators to succeed when there are excessively stringent and inconsistent decision processes used.

The good news is that some pink salmon have been showing up extremely late here in Port Graham, as well as in Nanwalek, and things are looking better than they were. We may not get any eggs, but at least the rivers will get a few more fish than it was looking like before. Our request to Fish and Game was both reasonable and justified. It would have been nice if they allowed Tutka to take any surplus eggs and then sat down with us over the next couple of months to go over their concerns.

Paul McCollum is a manager of Port Graham Hatchery.

September 2, 1999

Seward Phoenix Log
September 2, 1999

SeaLife Center volunteers examine wildlife

By Dee Dee Kay

For the LOG

Gretchen Blume from Real Time Images Ultrasound recently volunteered to help the Alaska SeaLife Center's veterinarian Dr. Pam Tuomi with cardiac exams of the common murres involved in implant research at the center.

She also recorded abdominal ultrasound images of Poco, the oldest (24-years-old) of the eight harbor seals, to determine if there were any obvious abdominal abnormalities that might help explain the seal's lack of weight gain this summer.

There were no visible liver, kidney or other abdominal tumors, but a long segment of intestine with a very thick wall was detected.

Follow-up tests of digestive function as part of the University of Alaska research program have been scheduled to detect possible inflammatory bowel disease.

Blume also checked the structures in the back of Poco's eyes that had not been previously examined because of her dense cataracts.

A detached retina on the right eye was found confirming her suspected blindness, but the posterior chamber of the left eye looked fairly normal.

Research seminars offered

The SeaLife Center provides opportunities to learn about current research through seminars offered throughout the year as scientists become available.

The seminars are free for Alaska SeaLife Center members or for people holding admission tickets on the day the seminars are scheduled.

Recently Dr. Marcus Horning from Texas A&M University gave a presentation about fur seals of the Galapagos Islands.

Dee Dee Kay is director of mar-

Corporate donations buoy exhibits

By Alex DeMarban

LOG Staff

Like the waters from Resurrection Bay that fill the sealife tanks, corporate donations continue to flow into the Alaska Sealife Center.

The center receives donations to the tune of about $200,000 to $300,000 a year, said Ben Ellis, the center's development director.

And SeaLife officials put the money to good use. The latest exhibit using donation money premiered Friday.

With a snip of the scissors, the Sealife Center dedicated the new Chiswell Island Exhibit.

The exhibit will allow the public to control remote video cameras to behold births, deaths and the more routine life-moments of the colony of Stellar sea lions that stake claim to the rocky outcrop.

On hand were representatives of Royal Caribbean International and Celebrity Cruises, which funded the majority of the exhibit with a $100,000 donation. The cruise line also brought in a crowd of journalists on the cruise ship Mercury to witness the event.

Dedication celebrations fell two days after the president of Royal Caribbean, Jack Williams, apologized to Juneau for the fouling of Lynn Canal and Gastineau Channel with oily bilge water and toxic chemicals in 1994 and 1995. The dumping led to 21 counts of felony violations of federal environmental laws.

Despite the timing, the SeaLife Center officials said the dedication was not part of the company's apology campaign.

"We received the first $50,000 a year ago, and the second in March," Ellis said. "We picked this dedication day two months ago. It was just ironic."

He added, "We do not support the dumping and fouling of the environment, but we appreciate the environmental awareness this company is trying to do."

Using solar and wind-powered cameras, Ellis said the exhibit allows the public to play the role of researchers in trying to understand the reasons for the dramatic drop in the Steller sea lion population in the last three decades.

The exhibit was installed this spring for a test run, and the public watched the birth of pups.

"We saw five births in the five days it was on," Ellis said. "It was pretty cool. Boom! All of a sudden this pup came out. It was there right on TV."

Another recent donation helped the SeaLife Center open up a tank in which visitors can use a magnifying piece and their fingers to explore intertidal animals like sea urchins, starfish and mussels.

Three weeks ago, First National Bank donated $175,000, funding the discovery touch tank pool on the center's upper level.

Chris Lee, the bank's branch manager, touted the touch tank as a valuable learning tool.

Nancy Erickson/LOG photo

First National Bank employee Dawn Kratz and her son, Sebastian, 3, check out the underwater creatures in the Alaska SeaLife Center's touch tank. Aug. 14 was appreciation day for the bank which donated $175,000 to the center.

Seward Phoenix Log
September 2, 1999

Wall Street Journal

In the Wake of Valdez, Alaska Hits Pay Dirt in Decade-Old Dirt

By Jeff D. Opdyke
Staff Reporter of The Wall Street Journal

The infamous Exxon Valdez has been renamed, Exxon Corp. has paid its fine and Capt. Joseph Hazelwood is completing his sentence of community service.

But there's still some sludge left over from the nation's worst oil spill, and Alaska wants you to buy it.

About 100 of the 2,000 soil and water samples taken from Prince William Sound back in 1989 remain on the shelves at the Alaska Department of Environmental Conservation. But they might not be around much longer.

The department has done a brisk business hawking the vials of goo it collected 10 years ago for the state attorney general's courtroom clash with Exxon. The samples were used to map the extent of the 1989 spill, which dumped an estimated 11 million gallons of crude into the sound.

When the trial was over in 1994, the state was looking at a hefty tab to dispose of the evidence. And the department's laboratory hit on the idea of peddling the stuff. In the past two years, the agency has pocketed more than $6,600, thanks to the hundreds of crude collectors from around the world who agreed to pay $5 for a bottle, or $10 for three.

So who has been springing for oily soil samples and noxious water waste? Requests have come from all 50 states, and locales as far away as New Zealand, Germany and the Philippines.

During one eight-week run, demand was so great that two staffers spent their working days doing nothing but packing and shipping samples.

At this point, Alan Love, the department's laboratory supervisor, says it wouldn't cost much just to throw the remaining stock away. But he and his colleagues figure they might as well keep the sale on a while longer, just in case anyone else wants to jump on the petroleum-history bandwagon.

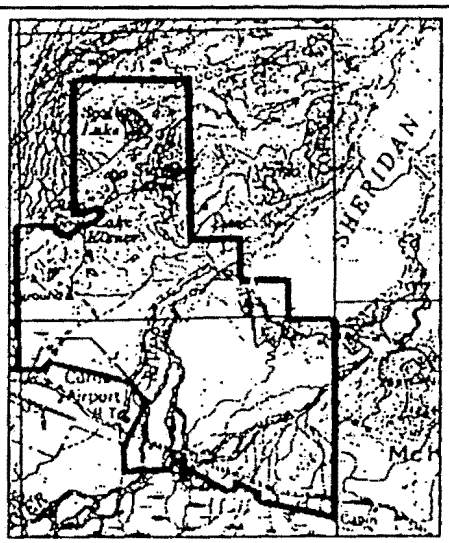
Some souvenir hunters have insisted their samples actually contain some Valdez oil. But not all do, since many were collected on beaches that were never lubricated.

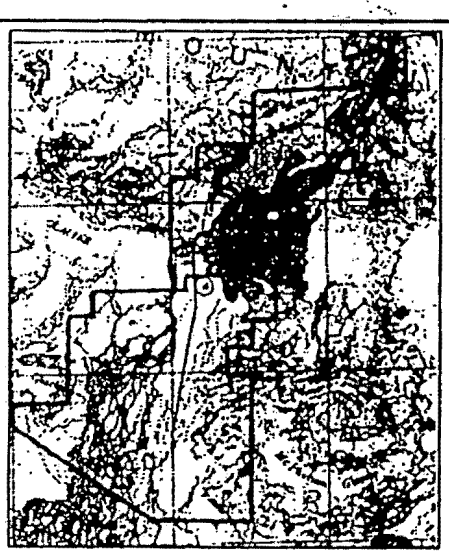
Mr. Love says the contents of most vials—basically water, sediment and some occasional oil—"are no worse than the balls of tar I used to chew on as gum when I was a kid." Nevertheless, he says, enclosed certificates of authenticity urge the curious not to open, touch, eat, smell or play with the encased goop.

"We just tell them to stick it on their bookshelf and admire it," he says. "Don't sniff it."

907-790-2169

The Cordova times
August 26, 1999





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State nixes plan to mix pink salmon from Tutka Bay and Port Graham

by J. Michael Lyons
Staff Writer

In less than two years, Port Graham's hatchery and cannery were rebuilt from a devastating January 1998 fire that destroyed both and snuffed out a sizable part of the village economy. But after a ribbon-cutting celebration in late June, the collective village eye turned toward the water to begin waiting for pink salmon that still haven't shown up.

The low return throughout Kachemak Bay this summer forced the Port Graham hatchery earlier this month to ask the Department of Fish and Game to break a cardinal rule and allow hatchery pinks from nearby Tutka Bay to be transplanted into Port Graham to ensure future runs.

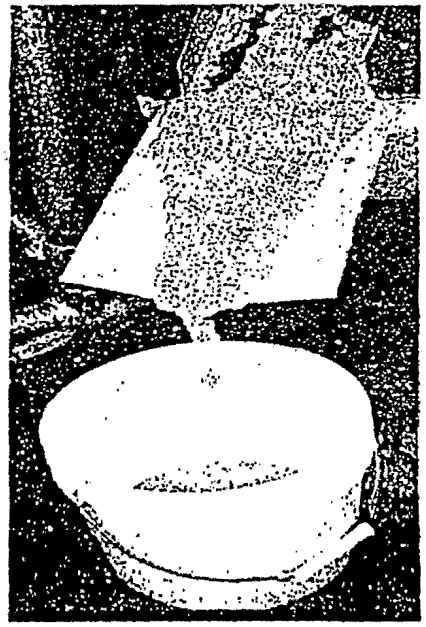
Fish and Game has balked, however, standing by a tenet of not mixing hatchery stock with wild salmon.

"This is a policy that is fundamental to protecting wild stocks," department commissioner Frank Rue said this week.

Hatchery manager Paul McCollum requested the Tutka Bay pinks as a way to save odd-year runs — 1999, 2001, etc. — in a fishery that has become a reliable source of food and cash for village residents, and for Port Graham Seafoods, which reopened its doors after the fire destroyed it and the hatchery's 1997 brood stock.

Pink salmon return after only two years, making them appealing to commercial fishermen. But destruction of the 1997 hatchery stock meant that egg collection this year would be completely reliant on the wild run, which, like other streams around Kachemak Bay this sum-

See DIVERSITY, Page 10



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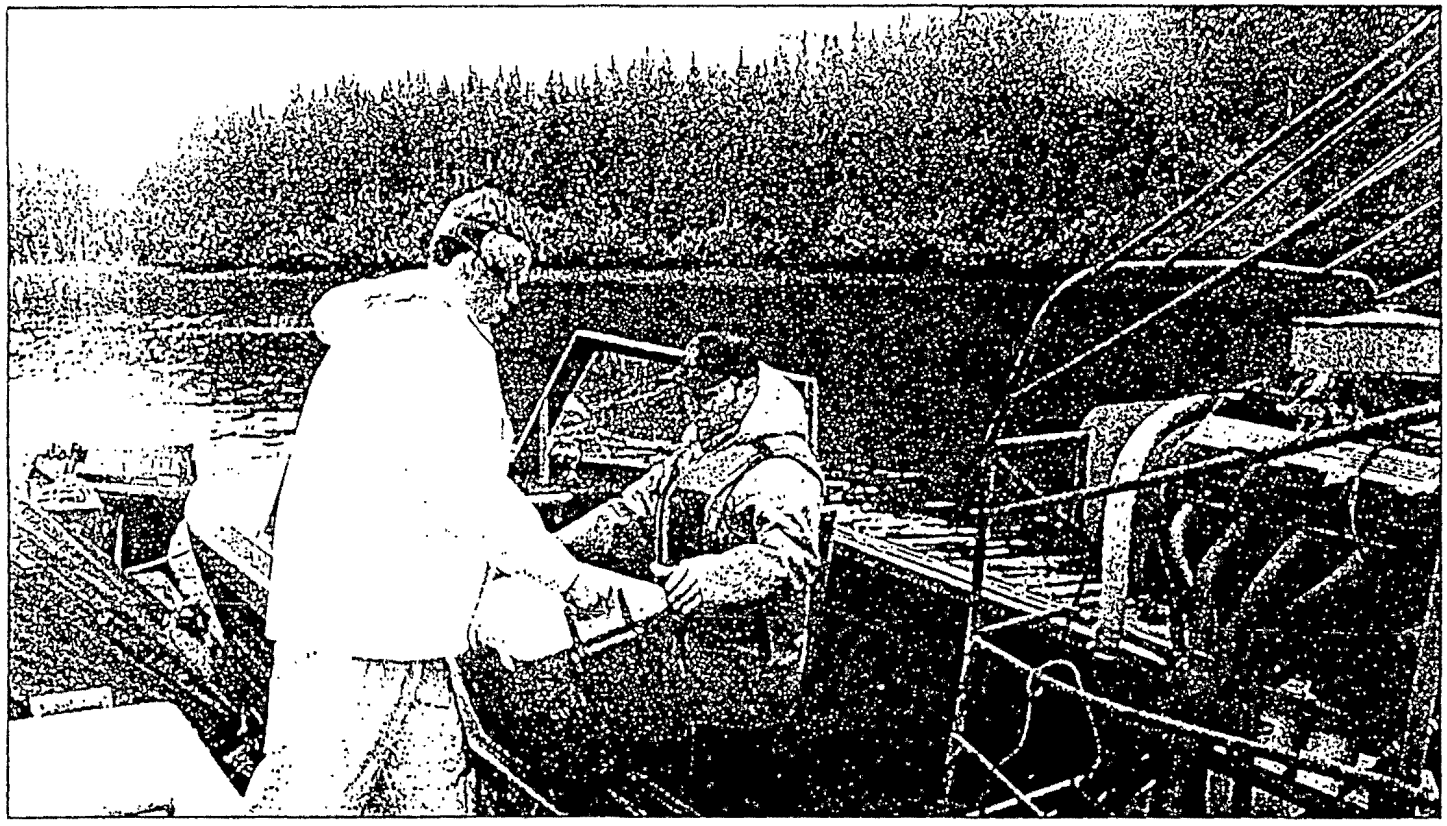

Photos by Joel Gay, Homer News

Tutka hatchery staff last week were finishing up their egg-collection efforts, in the process of putting some 125 million pink salmon eggs into incubation. Above, assistant hatchery manager Kadeon Waite takes another cooler from Nick Tirapelli on the floating dock. Below, eggs collect in a plastic bucket prior to being fertilized.

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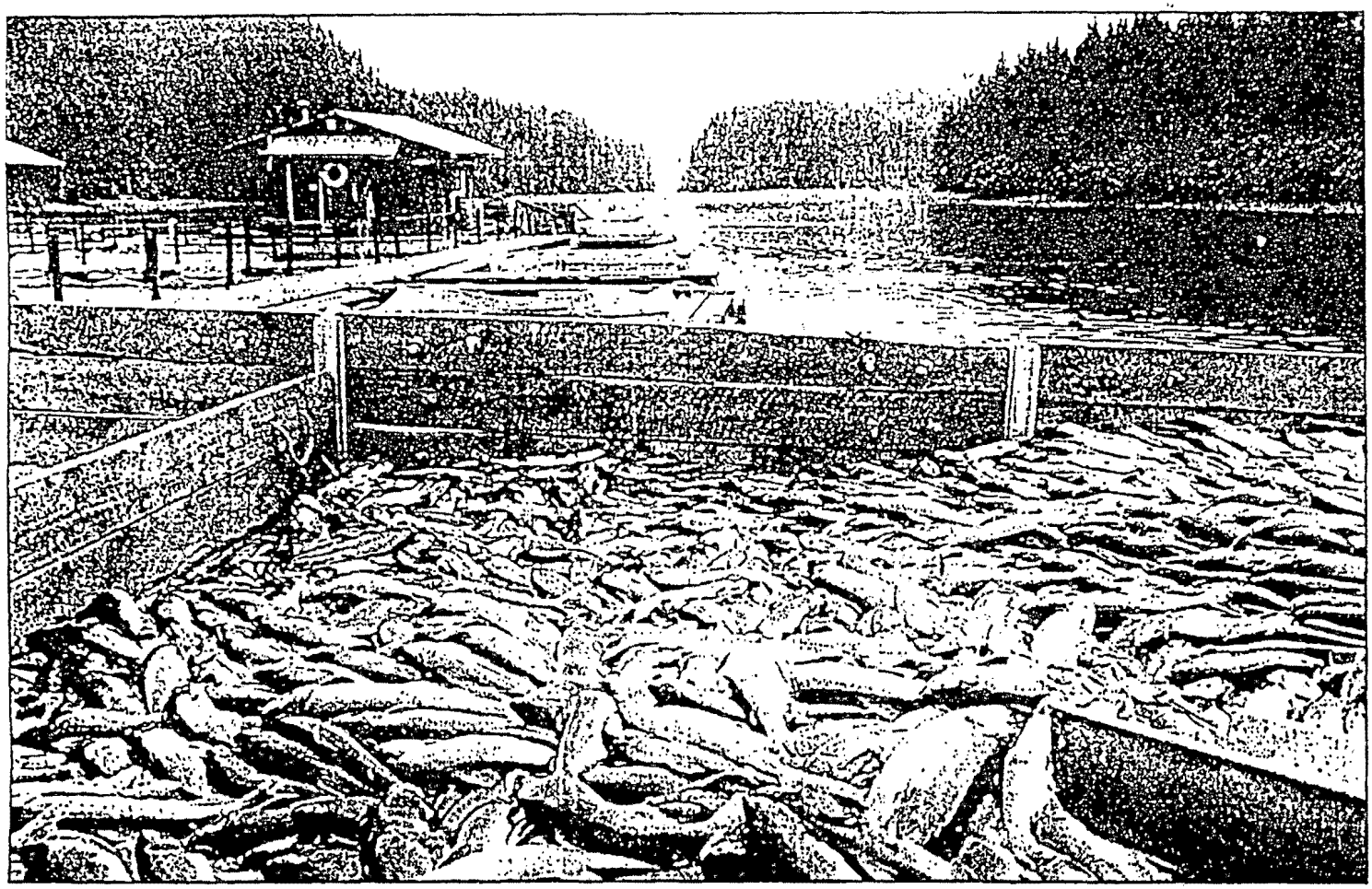

The hatchery offers pink salmon carcasses to interested takers, but few have voiced interested in them, according to hatchery staff. Those fish that aren't given away are barged into Tutka Bay and disposed of in deep water.

Each female pink yields about 1,400 eggs.

Homer News
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Photos by Joel Gay, Homer News

Joe Tandberg "bucks" the milt out of a male pink salmon. It takes half a cup of milt to fertilize three gallons of eggs.

HOMER NEWS

Diversity outweighs disaster, state says

FROM PAGE ONE

mer, has been absent.

"What we are looking at is a complete emergency situation," said McCollum.

Without that brood stock, McCollum fears repercussions mirroring those that plagued Port Graham pinks in 1963, when a run crash was felt for eight years.

Regulations stipulate that 6,000 pinks need to return to Port Graham River – protecting the wild run — before the hatchery can begin collecting eggs. Those eggs would be incubated, released into saltwater next spring, and return to the river two years later.

No brood stock this year would put the hatchery in the same position in 2001, and again in 2003, or until a sufficient number of pinks return to fill both the river's needs and the hatchery's.

Despite the fire, the hatchery had the ability to collect brood stock last summer to assure even-year returns.

Fish and Game biologists walked Port Graham River on Aug. 17 and counted 454 fish, a figure that illustrates this year's crash at Port Graham. The department's escapement goal for the river is 20,000 to 40,000 fish.

McCollum and others still had an eye on the water with the faint hope of an unprecedented late return. They floated the idea of borrowing Tutka Bay broodstock as a last resort.

But Fish and Game steadfastly stuck to its position of not pressuring wild salmon stocks with hatchery-raised fish. After some debate the department OK'd the Port Graham hatchery in 1991 only because it was agreed that Port Graham wild stock would be used to supply the hatchery's eggs.

"I understand their concerns, but our No. 1 responsibility is to protect the wild stock, and the Port Graham Hatchery was set up with that in mind," said Steve McGee, Fish and Game's manager of private, non-profit hatchery programs.

Tutka Bay pinks, which have been hatchery raised for 20 years, are smaller than Port Graham fish and return to spawning grounds earlier.

Those are the measurable differences between the two stocks of pinks, but Fish and Game also based its decision on genetic theory. The fish carry certain genetic differences, Fish and Game argues, and that alone is enough to make mixing the stocks scientifically inadvisable.

McCollum argued that the dire situation in the hatchery and its implications for Port Graham residents overrides scientific possibilities.

"That to me is paranoia, not biology," he said. "To me it's overzealous."

This year's dismal return and the possibility of feeble future runs will take a chunk of business away from Port Graham Seafoods, which processed 500,000 pounds of Port Graham pinks in 1997.

Without them the cannery will have to rely more on fisheries from elsewhere.

"As a processor I certainly like getting fish in my backyard," said cannery president Jay Lind. "We're just going to have to reach further to get the resource we need to keep the cannery going."

Lind estimates the Port Graham fish were a quarter of the cannery's business in 1997.

Unable to rely on a 2001 pink run, the hatchery will also suffer financially. The hatchery is allowed to sell a small percentage of its returns to pay for its operations.

"It's not going to put us out of the ball game but it's going to make it hard," said McCollum.

The hatchery also raises sockeye salmon that are released in English Bay River.

But there is a glint of hope remaining. Sport anglers have reported pink salmon chasing their bait and McCollum has seen jumpers in Port Graham.

"At this point we're just going to hope like heck some of these fish show up," he said. "We'll keep our fingers crossed."

Homer News
August 26, 1999

HOMER NEWS

OPINION

Editorial

Good reasons back decision not to mix hatchery fish

The Port Graham fish hatchery is suffering through some hard times because of a January 1998 fire that destroyed the 1997 year's brood stock of pink salmon. Because pinks return on a two-year cycle, the loss of one year's stock can have a ripple effect for every other year to come until a recovery.

That's just what has happened this year. As expected, this year's return of hatchery-bred pinks has been weak, and the combination of those fish and fish from the natural run have been insufficient to meet the hatchery's goals for the "odd-year" fish. Hatchery operators were hoping to skim a few million eggs from this year's run to make sure the return two years from now is strong. But instead of 20,000 to 40,000 returning fish, the estimate is around 1,000.

Unless the run recovers by natural means faster, hatchery operators are thinking it may take a decade for the odd-year return to get back to its former strength. That's where the idea of some human intervention came from. Hatchery manager Paul McCollum has asked the state to allow the hatchery to obtain eggs from pinks from nearby Tutka Lagoon to help the run recover faster.

While that might sound like a minor development to those unfamiliar with fisheries biology, it is not. Moving the fish a few miles from the waters of Tutka Bay to Port Graham is of major significance. It amounts to artificially mixing one genetic population of pinks with another population of pinks, and doing so can have catastrophic consequences.

The matter at stake here is virtually the same reason that the farming of salmon in Alaska is prohibited. Farmed salmon that escape captivity can end up competing with and winning out over wild salmon, in effect destroying natural runs of salmon. Such could be the same for Tutka Hatchery pinks, which might end up competing with natural Port Graham pinks to such a degree that they destroy them. That would doom any natural recovery of Port Graham pinks and eliminate one arm of diversity among pink salmon. Diversity is a key word in the viability of wild species. Diversity often equates to strength of survival. It is not something to casually diminish.

No one knows for certain if there would be such an effect from Tutka Hatchery pinks being raised and released in Port Graham. But once the damage is done there is little if anything to do to reverse it. Department of Fish and Game biologists are savvy enough to know not to tempt fate in this respect.

Not surprisingly, the state has thus far refused the request by Port Graham's hatchery to obtain Tutka Bay pinks. And as hard as it is to see Port Graham's fishery suffer in this respect, that is the appropriate decision. We empathize with those who depend on the Port Graham pinks fishery. But nobody wants to see, a few years from now, that an attempted fix has caused even more damage, perhaps the end of the truly natural run of pink salmon in Port Graham.

— Mark Turner, Editor and Publisher

Kasilof plan highlights new approach to spill response

By SHANA LOSHBAUGH
Peninsula Clarion

The devil, so the saying goes, is in the details.

During the 1989 Exxon Valdez disaster in Prince William Sound, spill responders often found their advance plans too vague to help. But if an oil spill hit Cook Inlet tomorrow, the 1999 response would be far more sophisticated.

One reason is a pending detailed addition to the Cook Inlet Sub-area Contingency Plan for Oil and Hazardous Substances Spills and Releases. This year a public-private committee is developing geographic response strategies — GRS — that get down to the devilish details.

"The end user of this project is a guy in the field putting boom out," said Tim Robertson, a consultant compiling the information. "We want it to be user friendly."

Eventually much of the information will be posted on the Internet or distributed on CD-ROM, he said.

Friday, Robertson presented a draft of a sample GRS manual to a meeting of government and industry spill response managers at the Cook Inlet Spill Prevention and Response, Inc., office in Nikiski.

The draft covers the central Cook Inlet response zone, which on the east side runs from Anchor Point to Point Possession. It shows different types of response equipment and how to deploy each. For example, it distinguishes among deflection, diversion and exclusion booming units.

The project develops generic modules of equipment and instructions that can be applied and adapted in diverse situations.

The sample used the mouth of the Kasilof River as an example of a site that might need emergency protection. If prevention and containment efforts in the inlet failed to keep oil or other hazardous substances away from the fish-rich waterway, responders might need to set out protective boom at Kasilof as a third line of defense.

Bret Hartley of Project and Crisis Management Inc., Robertson's partner on the project, said, "We started with the Kasilof

See SPILL, back page

...Spill

Continued from page A-1

because CISPRI had recently done an exercise there. We wanted to tackle it while memories were fresh."

Eventually, CISPRI plans to run drills on each site to fine tune the plans. In the meantime, Robertson, Hartley and the committee are using charts, maps, overflights and local knowledge to draw up the GRS plans.

The draft sample lists why the Kasilof estuary is vulnerable — it is the site of a large salmon run, intertidal spawning areas, heavy recreational use, fragile coastal marshes and seasonal concentrations of shorebirds and waterfowl. The document includes details such as navigation markers in the river channel, phone numbers of adjacent property owners and seasonal restraints, such as which roads are not plowed in winter.

A map of the river mouth shows recommended anchor points for oil boom at the Cook Inlet Processor and Trans-Aqua canneries, road-accessible staging areas on both sides of the river and the extent of tidal flats.

"These tidal flats pose an incredible challenge," Hartley said of the site.

Birds congregate on them; they are too wet and unstable for terrestrial equipment, too shallow for boats and, according to Hartley, impossible to protect outside the river mouth.

The 15 people at the meeting represented groups such as CISPRI, Marathon Oil, the Cook Inlet Regional Citizens Advisory Council, the U.S. Coast Guard, the U.S. Fish and Wildlife Service and the Alaska departments of Fish and Game, Natural Resources and Environmental Conservation. They picked through the Kasilof sample, perfecting the format to use as a model for other sites.

GRS plans are in development for 12 west-side sites and one on Kalgin Island. Other east-side sites in the zone with plans under development are Anchor River, Stariski Creek, Deep Creek, Ninilchik River, Clam Gulch, Kenai River, East Foreland and the Swanson River.

The project is progressing faster and better than anticipated, c[illegible]zers told the meeting.

"For the most part, everyone has done an exceptional job," said Eric Haugstad, from Tesoro Maritime Company, a member of CISPRI's board of directors. "I think we've made great strides."

Other states have areawide GRS plans, but Cook Inlet's will be a first for Alaska, he said.

Work began on the GRS planning in April. The final draft should be done in time for the Nov. 3 CISPRI meeting.

After that, the project will go to the area committee for incorporation into the area plan.

The area plan will be reviewed, probably during the winter, in a public hearing process.

Robertson said the GRS project is the most progressive he has ever worked on.

About 20 entities, led by the state DEC, signed a memorandum of agreement in the spring to do the project. Industry and government are working together to get the best possible contingency plans at the least cost, he said.

Robertson named Mike Munger of the DEC and Haugstad as the key people generating the momentum.

"This is a win-win for all involved," Munger said.

Peninsula Clarion
8/23/99

Hatchery begs for salmon

S[illegible]e denies plea for Tutka Bay pinks

ADN 8-20-99

By JON LITTLE
Daily News, Peninsula Bureau [illegible]

SOLDOTNA — Most of Alaska is
awash in pink salmon, but the fish are
carce in Kachemak Bay, prompting
Port Graham's fish hatchery to plead
with the state to break a cardinal rule.
The hatchery wants to take salmon
rom nearby Tutka Bay be-
ause there aren't enough
inks returning
o Port Graham River. If it can't do
hat, said hatchery manager Paul Mc-
ollum, the run of pink salmon that
upports an important local subsis-
ence and commercial fishery may
ake eight to 12 years to recover.
"It's a real emergency situation,"
IcCollum said. "Within a short amount
time, the opportunity will be lost and

■ KUSKO SILVERS: Commercial season likely over. B-4

HATCHERY: Breeders ask state to waive the rules

Continued from Page B-1

we'll be up the proverbial creek."

The state Department of Fish and Game on Monday denied the hatchery's first request. But with just a few days left before the Tutka Bay pink run ends, McCollum is begging the department to reconsider. He said he's got all the fishing gear ready to go, but just needs an OK.

Emergency or not, the odds of the state changing its position are slim, said Steve McGee, a state commercial fisheries biologist who oversees Alaska's 40 privately operated hatcheries.

Biologists who review these requests say there's too great a risk that salmon born from hatchery-raised Tutka stocks would wind up competing with the wild Port Graham stocks, McGee said. And the biologists' first duty is to protect the genetic diversity of Alaska's wild fish runs, he said.

"I don't expect any of the reviewers to change their minds," he said. "I'm virtually positive they won't, so the only person who could change this would be the commissioner. He would have to disregard the advice of his staff."

If the hatchery can't get what it wants, its effort to rebuild after a devastating January 1998 fire will stop tantalizingly short of its goal. The fire wiped out the hatchery's brood stock of what are known as odd-year fish, which it needs to bring the facility up to speed.

Pink salmon fatten up and spawn in just two years, which makes them appealing to commercial fishermen. Without brood stock from 1999, the 2001 fish run could be dismal again, McCollum said. Left unchecked, the pattern could continue for years.

The hatchery had hoped that the natural run of Port Graham pinks this summer would be big enough for it to skim a few million eggs so it could enhance the natural run.

But the river that's supposed to have 20,000 to 40,000 spawners had only 1,000 fish in it this week, biologists said. The last time Port Graham's pink run failed this badly, in 1963, it took a decade for the system to recover, McCollum said.

He argues that the potential of stalled commercial and subsistence fisheries every other year, for a decade is worse than the risk that stocks from Tutka Bay will somehow damage the gene pool of Port Graham pinks.

McGee disagreed, saying history has shown salmon streams in the same dire straits have recovered faster than expected. Also, he said, a history of stocking genetically similar salmon in Pacific Northwest streams has added to that region's horrific crashes. He compared it to farmers planting a uniform stock of corn that turns out to be susceptible to a certain disease or insect.

The Port Graham hatchery opened for business in 1992, but has never come close to achieving its goal of fertilizing 110 million eggs, McGee said.

Biologists were uncomfortable with the hatchery before it opened but reluctantly approved its plan of operation after making sure that it could only use pinks that naturally return to Port Graham River, he said.

Fish raised in hatcheries aren't supposed to head upstream to spawn, but there's always a few that stray into nearby streams, McGee said. The rest of the fish are caught just offshore to sell and to supply the next year's brood stock.

With the current rule in place, McGee said, a hatchery-raised pink that strays into nearby Port Graham River will at least be part of that system's natural gene pool.

Reporter Jon Little can be reached at jlittle@adn.com.

Anchorage Daily News 8/20/99

Eyak access fees worth a lot of debate

By Alberto Cagliano

The Cordova Times

Almost a month since their application, the new fees to access Eyak Corp. land are becoming a recurrent topic of conversation among Cordovans.

The Eyak Corp. Board of Directors approved the new noncommercial fees July 25, increasing the old $5 monthly flat fee up to $35 per day for nonshareholder Cordova residents and to $250 per day for nonresidents. Seasonal access permits cost $250 for locals, $2,500 for nonresidents.

Commercial fees have existed on Eyak property for many years, said Brian Lettech, Eyak Corp. general manager. These fees are handled case by case and vary according to the number of persons involved and the type of activity.

Eyak shareholders can wander the corporation lands freely and are allowed to take guests along. But nonshareholders older than 60 who step on Eyak land on their own are required to pay some of the highest access fees in the state.

Hunters, fishermen, campers, off-road vehicle riders, firewood gatherers a berry-pickers need to buy from the corp ration a $35 day-permit. Those who are

See Eyak, Page 2

Hatchery asks state to reconsider its request for importing salmon

SOLDOTNA (AP) — A fish hatchery at Port Graham wants the state to reconsider its request for importing pink salmon from nearby Tutka Bay at a time when much of the rest of Alaska is overflowing with the fish.

The hatchery wants the Tutka Bay salmon because there aren't enough pinks returning to Port Graham River. If it can't do that, then the run of pink salmon that supports an important local subsistence and commercial fishery may take eight to 12 years to recover, hatchery manager Paul McCollum said.

"It's a real emergency situation," McCollum told the *Anchorage Daily News*. "Within a short amount of time, the opportunity will be lost and we'll be up the proverbial creek."

The state Department of Fish and Game denied the hatchery's first request Monday. But with just a few days left before the Tutka Bay pink run ends, McCollum is begging the department to reconsider. He said he's got all the fishing gear ready to go, but simply needs an OK.

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If the hatchery can't get what it wants, then its effort to rebuild after a disastrous fire in January of 1998 will stop short of its goal. The fire wiped out the hatchery's brood stock of what are known as odd-year fish, which it needs to bring the facility up to speed.

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With the current rule in place, a hatchery-raised pink that strays into nearby Port Graham River at least will be part of that system's natural gene pool, McGee said.

The Cordova Time
August 19, 1999

Point of View

Upcoming Cook Inlet oil forum demands attention

by James E. Carter, Sr.

The grounding of the Exxon Valdez 10 years ago resulted in a major overhaul of the oil transportation system in Prince William Sound. A sense of complacency has been replaced with vigorous oversight by state and federal regulations and the Prince William Sound Regional Citizens Advisory Council. Oil tankers leave Valdez with tug escorts, and are monitored by a vessel tracking system that incorporates the best available technology. The prevention measures in place have significantly reduced the likelihood of an oil spill in Prince William Sound.

Unfortunately, the same kind of attention has not been focused on Cook Inlet. The waterway is a critical transportation link for southcentral Alaska, serving over half of the state's population. Marine traffic in Cook Inlet includes everything from oil tankers, freight ships and liquid natural gas vessels to urea barges, wood-chip haulers and cruise ships. These vessels operate without the prevention measures present in Prince William Sound. There are no tug assist vessels, and the only vessel traffic system being used is radio communication between the ships as they make their way up and down the Inlet. What's in place in Cook Inlet cannot be categorized as the best available technology and pales in comparison to Prince William Sound.

Although there has not been an incident on the scale of the Exxon Valdez oil spill, Cook Inlet has seen its share of marine mishaps. In 1987, the tanker Glacier Bay hit a submerged rock and lost 130,000 gallons of crude oil. The spill forced the state to shut down the multi-million-dollar commercial salmon season in Cook Inlet that summer. Last winter, the tanker Chesapeake Trader, operating in some of the worst ice conditions the Inlet has seen in decades, suffered a crack in its hull after being forced to leave the Nikiski dock due to the presence of ice. The tanker lost approximately 10 barrels of crude oil as a result of the crack. The oil did not reach the shoreline and quickly dissipated, but the vessel was carrying 205,000 barrels of crude oil, and the potential for a much greater spill definitely existed.

The Cook Inlet Regional Citizens Advisory Council has made repeated attempts to have improvements made to the oil transportation system in Cook Inlet, but the results of these efforts are not very encouraging. For example, a request from the Council for a tug assist vehicle in Cook Inlet was rejected on the basis that a risk-analysis study didn't justify the need for such a vessel. It's as though there has to be a catastrophic spill in Cook Inlet before prevention measures are given serious consideration.

It's as though there has to be a catastrophic spill in Cook Inlet before prevention measures are given serious consideration.

The concern in Cook Inlet is not just about oil tanker traffic. The tankers make up just a small percentage of the marine transportation business in the Inlet. The recent incident in Oregon involving the wood-chip hauler New Carissa is a sad example of the damage that can be caused by a non-crude-oil vessel. The freighter ran aground near Coos Bay during a storm and eventually spilled 70,000 gallons of fuel. Some of the heavy oil ended up on the beach and injured wildlife in the area. Although there hasn't been a New Carissa-type accident in Cook Inlet, the potential for a major oil spill from non-crude-oil vessels is real and needs to be dealt with.

Cook Inlet RCAC is interested in taking a comprehensive look at the issue of safety of navigation in Cook Inlet. Toward that end, the Council is sponsoring a forum in Homer on Sept. 9 and 10 that will bring together all interested parties for a discussion about this particular subject. The Cook Inlet RCAC has invited shipping companies, marine pilots, environmental organizations, federal and state regulatory agencies, Native organizations, commercial and sport fishing groups, recreational users, aquaculture associations, chambers of commerce and local mayors to participate.

The goal of the forum is to identify prevention measures that are needed in Cook Inlet and determine how those measures can be implemented. The public's involvement in this forum is critical to its success and we urge all citizens with an interest in the waters of Cook Inlet to attend. Please call Joe Gallagher or Jim Carter at Cook Inlet RCAC at (800) 652-7222 for more information.

James E. Carter, Sr. is executive director of the Cook Inlet Regional Citizens' Advisory Council.

Homer News
8/12/99

Notice: New ANC Afognak Island Land Use Policy

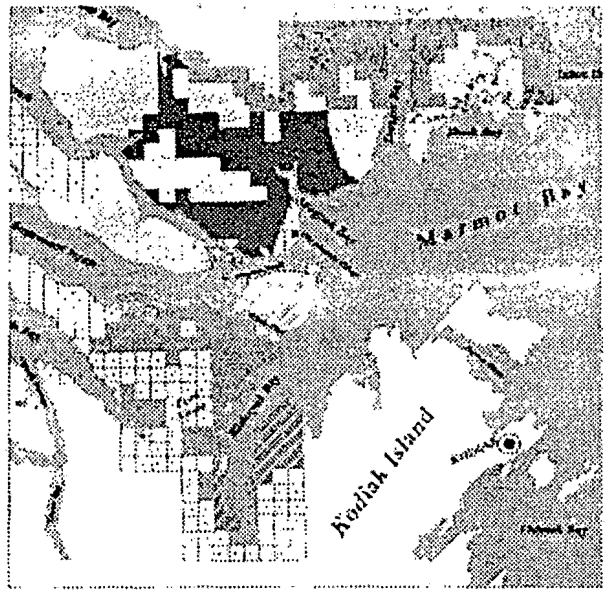
The Afognak Native Corporation (ANC) has established a Land Use Policy that states, "Shareholders, through the corporation, will own and control a culturally protected land base in perpetuity, which will provide for the opportunity of first land use." Accordingly, as of August 1, 1999, ANC has instated a land use permit system. Users of ANC lands for hunting, fishing, recreation or any other purposes will be required to obtain a land use permit.

Permits Now required

Permits can be obtained at the ANC office during its regular business hours of 8 am to 5 pm Monday through Friday at 215 Mission Road, Suite 212 in Kodiak, Alaska. Permit applications can also be faxed or e-mailed to applicants. Potential users of ANC lands are encouraged to send in applications as early as possible so the permits can be issued well in advance of using ANC lands.

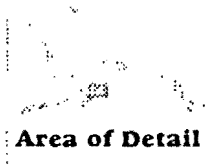
Permit Fee structure

ANC shareholders, their spouses and dependents...	$	No charge
Koniag shareholders...	$	35 annual
General public...	$	125 annual
One day pass...	$	35 day
Bear hunt...	$	1,200 season
Elk hunt...	$	75 season
Minors under the age of 16...	$	No charge



Afognak Native Corporation
215 Mission Road, Suite 212
Kodiak, Alaska 99615
(907) 486-6014 • fax (907) 486-2514
e-mail: peter@afognak.com

LAND USE DESIGNATION
- Afognak Area I
- Afognak Area II
- Raspberry/Whale Islands
- Kodiak Area I
- Kodiak Area 2



Please contact ANC for a more detailed map.

If you plan to hunt, then you must obtain an annual permit, even if you plan to hunt only one day. Elk and bear endorsement charges are in addition to the annual permit changes.

Permission to enter and use the permit area is conditional on your compliance with all rules and restrictions and may be revoked if you fail to comply. You must at all times display the permit prominently outside of your outermost clothing layer so that we can readily identify that you are a permitted user. By doing so, you will reduce the likelihood that an ANC security officer will approach you to check for a permit while you are in the field.

Allowable Uses

Afognak Area I- Open to public use, foot traffic only. Closed to ATV use. Conditionally opened to public camping. Program supplying shareholder access to road areas provided.

Afognak Area II- Public deer hunting open October 15-December 31 only. Closed to ATV use. Closed to public camping. Program supplying shareholder access to road areas provided.

Raspberry/Whale Islands- Open for public use. Closed to ATV use.

Kodiak Area I- Public hunting open October 15-December 31. Shareholder ATV use only. Closed to public camping.

Kodiak Area 2- Open for public use. Shareholder ATV use only. Camping opened to public.

Kodiak Daily Mirror
August 11, 1999

ANCHORAGE DAILY NEWS
8/10/99
PG 1 OF 4

Scientists hit 'jackpot' with new sea creature

By NATALIE PHILLIPS
Daily News reporter

HOMER — Charles and Gretchen Lambert oohed and awed as they crawled around the harbor docks Sunday, hoisting slime-encrusted ropes and buoys lodged below the docks. "We've got the jackpot here," shouted Charles Lambert.

The two biologists had arrived in Homer just hours earlier to investigate a report that a new sea creature had been discovered in Kachemak Bay.

Clinging to one of the ropes they pulled up were globs of what they came to see: a never-before-identified member of the sea squirt family. The clumps looked like orange-tinted clusters of cauliflower heads. But as the Lamberts quickly and enthusiastically pointed out, they were colonies of individuals, each with its own heart and nerve and digestive systems.

"It's surprising no one had noticed them before, they are so abundant," Gretchen Lambert said. "Sometimes species go unrecognized because of misidentification. But sometimes people think that it is so common surely somebody must know about it."

Fishermen and tourists wandering the docks looked with curiosity as they stepped over the Lamberts' outstretched legs. The Lamberts seemed not to notice.

They are quite certain the new species of sea squirt is unique and indigenous to Kachemak Bay. They plan to spend another week visiting a half-dozen other Alaska harbors to see if it can be found

Please see Back Page,
JACKPOT

JACKPOT: Sea creature

Continued from Page A-1

elsewhere. Then they will return to their laboratory in Seattle where Gretchen Lambert will spend the next several months studying the samples. Some specimens will be shipped to the Smithsonian Institution for cataloging and archiving. Then she will write a scholarly paper on the discovery.

That's when the new sea squirt will get its name.

"The first time the name appears in print, that name sticks," she explained. So she is mum about her ideas. She wants it to appear first in a scholarly journal. But she promised the name "will commemorate the great state of Alaska." And if it isn't found in any other Alaskan harbors, the name will probably somehow capture its Kachemak Bay home.

While it is not unheard of for new species to be found in Alaska, it is rare enough that the staff at the U.S. Fish and Wildlife Service was pretty excited at the news, said LaVerne Smith, the agency's assistant regional director of fisheries and ecological services. When new species are found in Alaska, they tend to be in the marine environment because it has not been studied as much as the land, she said.

The specimen found in Kachemak Bay is believed to be the third species of sea squirt found in the state, Gretchen Lambert said. "They are good guys. They are filterers."

Sea squirts are also known in the scientific world as "ascidians" or "tunicates." They are members of the chordata family. Some chordates have the characteristics of invertebrates, but others have the characteristics of vertebrates. So in some ways the chorodates link the two major divisions of the animal kingdom, according to "Under Alaskan Seas," a book by Lou and Nancy Barr. The ascidians, or sea squirts, are most often lumped with invertebrates.

As larvae, sea squirts are free swimming and look a bit like tadpoles. After a brief period in open water, the larvae latch to a solid surface, their tails are reabsorbed, and they live there permanently. Sea squirts can be found in many sizes around the world. In Japan, France and Chile they are considered a delicacy. The sea squirt found in Kachemak Bay appears to mature at 1 to 2 inches in length.

They have two valves. Water moves steadily through one valve and into an internal chamber, where gases are exchanged and food particles from the water are caught on strands of mucus, then the cleansed water passes out through a second valve.

The name "sea squirt" is derived from what happens if something disturbs them. They quickly contract their muscles and squirt a jet of water from one of their two siphons.

Some species of sea squirts live for a number years, but the Kachemak Bay sea squirts appear to be kept in check by cold weather. The colonies die off in the fall leaving only buds, Gretchen Lambert said.

The first inkling there might be an unidentified species lurking in the

Homer harbor came last fall. A group of scientists led by a team from the Smithsonian had put out collection devices called "fouling plates" as part of an ongoing study of what nonindigenous species might be arriving in Alaska ports via cargo ships' ballast waters.

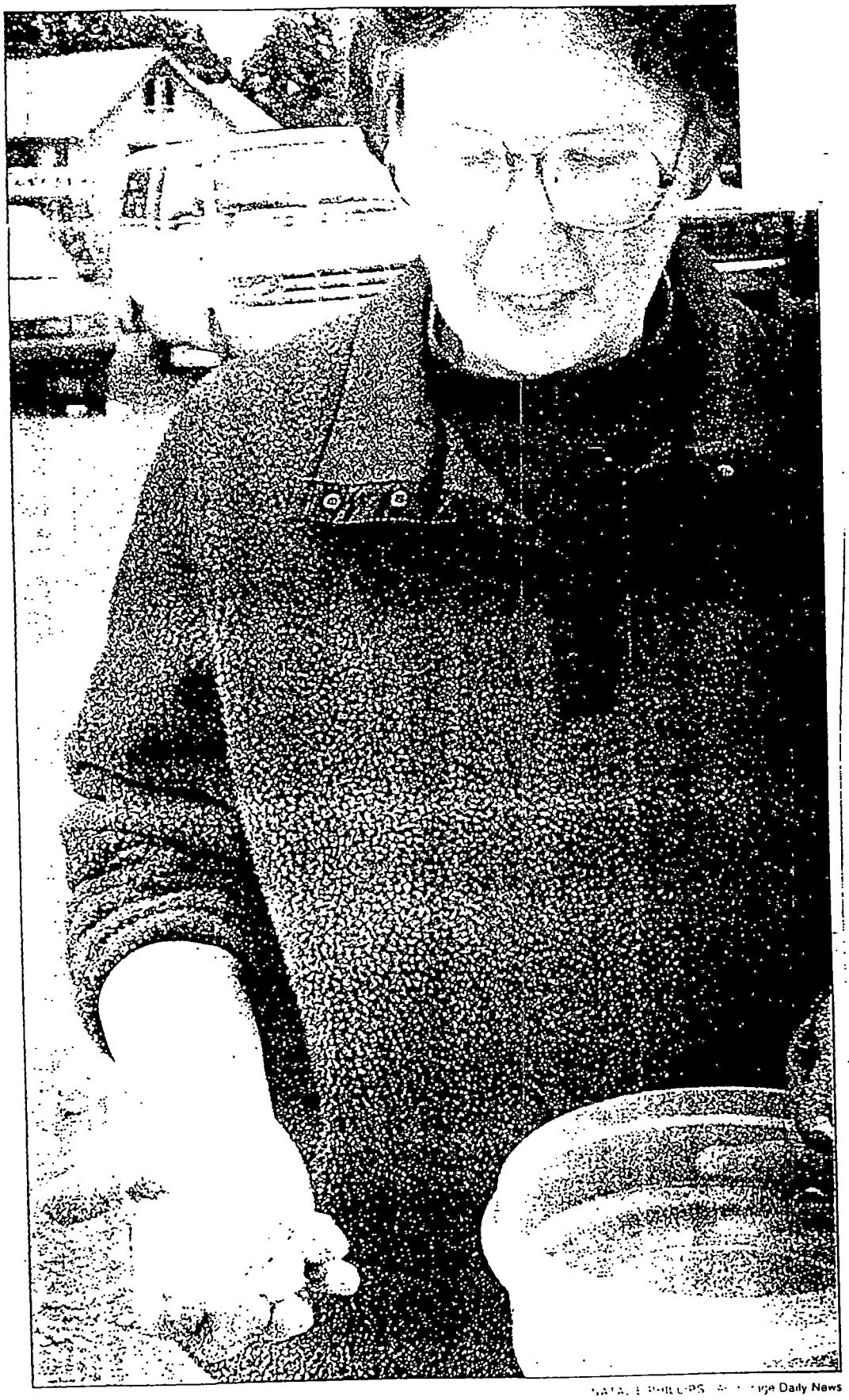
What appeared to be sea squirts were part of the mix on the plates and were sent for positive identification to the Lamberts, among the nation's foremost experts on sea squirts. The Lamberts spent more than 25 years at the University of California at Fullerton. He was a professor; she was a researcher.

Sea squirts are their love. They retired a year ago and moved to Seattle but still travel the world with a research and lecture schedule. Since 1975, they have published a twice-annual sea squirt newsletter, which can be found on the Internet.

"I knew right away, and the more I looked at it, I knew that it was something new," Gretchen Lambert said. To be sure, she contacted Gary Sonneville with the U.S. Fish and Wildlife Service in Soldotna and asked him to go to the Homer harbor to collect more samples.

She then sent specimens to a sea squirt expert in Russia. The Russian expert said the specimen looked a lot like the one found in Kamchatka, but he too said it appears to be distinct.

❐ Reporter Natalie Phillips can be reached at 257-4461 or nphillips@adn.com.



NATALIE PHILLIPS ... Daily News

Gretchen Lambert of Seattle, one of the few sea squirt experts in the world, came to Homer to collect samples of a rare species of sea squirt

Alaska Journal of Commerce

Land sale adds big bump to years of profitability for Koniag

Corporations' investments, dividends worth millions to Alaska's economy

Alaska Native corporations are bringing hundreds of millions of dollars in new investment to Alaska and are paying tens of millions of dollars in annual dividends yearly to shareholders, most of whom live in Alaska.

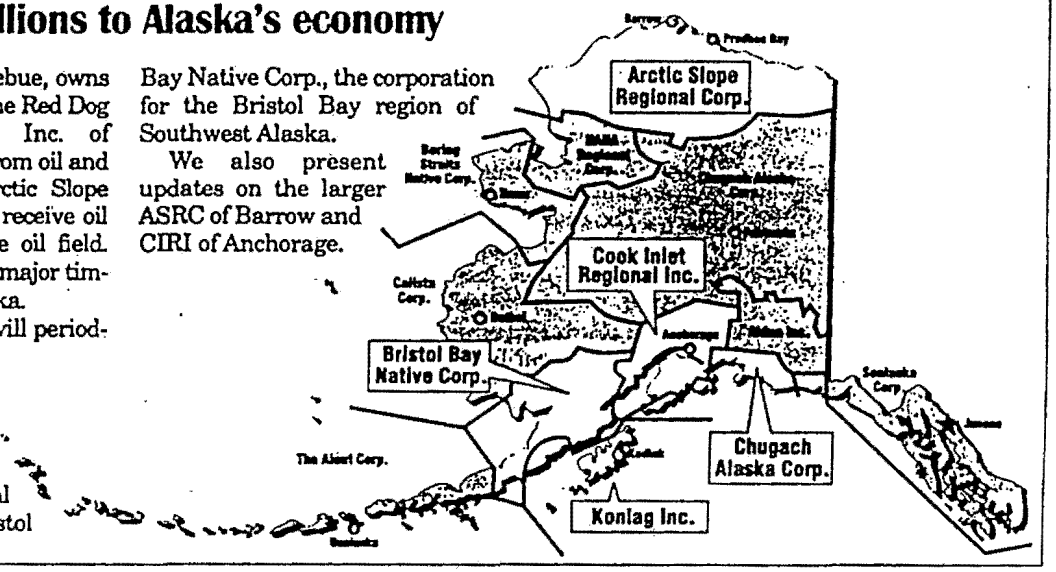
The corporations, formed with the land and cash settlement of the Native land claims dispute with the federal government in 1971, are in a wide range of business activities.

They range from major industrial service enterprises to tourism-related cruises and hotels, to high-tech firms in the Lower 48 states.

The corporations are active in Alaska resource development. One region, NANA Regional Corp. of Kotzebue, owns the world's largest zinc mine, the Red Dog Mine. Cook Inlet Region Inc. of Anchorage, receives royalties from oil and gas production, and soon Arctic Slope Regional Corp. of Barrow will receive oil royalties from the new Alpine oil field. Sealaska Corp., of Juneau, is a major timber operator in Southeast Alaska.

The Journal of Commerce will periodically profile these enterprises and their business activities. This issue we profile two of the smaller regional corporations, Koniag Inc., the Kodiak-area regional Native corporation, and Bristol Bay Native Corp., the corporation for the Bristol Bay region of Southwest Alaska.

We also present updates on the larger ASRC of Barrow and CIRI of Anchorage.



By Tim Bradner
Journal Reporter

Last year was good for Koniag. It was also a good year — a very good year, in fact — for Koniag's shareholders.

The corporation closed its books for the year March 31, and a net after-tax profit exceeding $14.3 million recently has been tallied. This is almost twice the $8.4 million net recorded the year before.

After years of losses, Koniag turned a profit in 1994 and has made money ever since.

That year Koniag hired a new chief executive, sold some assets and sold net operating losses which helped recoup its capital investments, said Kurt Martens, senior vice president of finance.

Koniag's shareholders did well last year, too. Besides its regular dividend from operating profits, this year estimated to be $3 per share ($300 for a typical Koniag shareholder with 100 shares), Koniag has paid out $34 million in special dividends in the last 13 months.

Those were proceeds from a sale of some Koniag lands to the Exxon Valdez Oil Spill trust. The payments, in two distributions, work out to $10,300 for most of the corporation's 3,300 shareholders, those who own 100-share blocks.

About 54 percent of Koniag's shareholders live in Alaska, about half of those on Kodiak Island.

The big bump in 1998 profits resulted mainly from the sale of lands to the spill trust, a one-time event. But Koniag's operating revenues, from its investment portfolio and operating companies, has been climbing steadily. Operating revenues were in the $9.8 million range in 1998 and 1997, increasing from $9.26 million in 1996, $6.28 mil-

lion in 1995 and $2.82 million in 1994.

The corporation's 10-year business plan is to have 50 percent of its assets, now about $55 million, in financial securities, 30 percent in real estate and 20 percent in operating businesses.

Koniag is moving cautiously in building its real estate portfolio, beginning with commercial properties like offices and warehouses, with plans to move into apartments. Last year Koniag purchased an office complex in Salt Lake City with other investors from Anchorage and recently closed on an office/warehouse facility north of Seattle. The corporation is now looking to diversify. Two areas being considered are Spokane and Phoenix.

Geographic diversity also brings a diversity in the types of investments, Koniag chief executive Uwe Gross pointed out. Phoenix, for example, has an economy more driven by recreation and populations of retired people, different than the industrial Northwest, where Koniag now has properties.

Part of Koniag's assets are also being put out as venture capital. One Alaska company Koniag has a stake in is Comcepts, a telecommunications firm doing work in Russia. Due diligence is now under way for an investment in a firm near Detroit engaged in transportation-related technology.

Koniag hopes to eventually form a venture capital group with several Alaska Native corporations. A prospectus for such a group is now being circulated among the 13 regional corporations and several village corporations. The minimum-size fund Koniag hopes to establish is $10 million, but it could be much larger.

One of Koniag's businesses, ICRC Energy Inc., which focuses on transportation and energy technology, opened an Alaska office earlier this year in Eagle River.

The firm, with seven employees here, is doing environmental work with local architectural and engineering firms and will be involved in work on rural bulk fuel storage plants being funded by the new Denali Commission.

"We feel very good about how they've done. ICRC's office has just been open four months, and is already generating positive cash-flow," Gross said.

ICRC hopes to be involved with the Alaska Aerospace Development Corp. in developments related to its Kodiak Launch Facility. As activities increase at the launch facility, ICRC will be in a position to train and hire Koniag shareholders who live on the island, Gross said.

Sonneville International Corp. and The Permanent Way Corp. are two other transportation technology firms, both based in Alexandria, Va., owned by Koniag.

SIC is an international company with innovative rail truck technology, and is working on light rail projects in Brazil, South Korea, Japan, Hong Kong and elsewhere.

Permanent Way, specializing in rail truck technology domestically, has projects in several U.S. cities and expects to do well as the federal government puts more money into light rail and upgrading the nation's heavy rail system.

Koniag's strategy with its operating companies is to find synergies so that the companies can work together, in subcontractor relationships, said Koniag President Dennis Metrokin.

Koniag's ultimate aim is to build vertical intergration into its businesses, he said. This means buying or investing in companies that supply its other businesses and eliminate other profit going to outside entities, Martens said.

Koniag's companies are developing now to the point that the corporation is achieving a level of core competence in strategic areas, particularly transportation technology, Gross said.

> Koniag's companies are achieving core competence in strategic areas ... but the corporation is moving away from timber.

One business Koniag is moving away from, however, is timber. The Afognak Joint Venture, a company jointly owned with village corporations on Kodiak (Koniag owns 47 percent) is being disbanded. The company harvested timber very profitably from 1989 to 1997 on Afognak Island, north of Kodiak.

But in 1997 timber markets in Japan went very sour and operations were shut down. Earlier this year the decision was made to diversify the corporation, and become less reliant on timber sales to fund the corporation, Martens said.

Koniag will still own substantial timber lands, how much and where are matters still being negotiated with its partners (the ownership in AJV is a joint undivided interest).

After that, decisions will be made on what to do with the timber. Logging could be resumed, or the timber lands could be sold to the state or federal government for additions to wildlife refuges on Kodiak.

Koniag retains ownership of substantial lands on Kodiak, including a lot of acreage that is inholdings within Kodiak's federal wildlife refuge.

Some of this may eventually be exchanged with the federal government, but the corporation intends to form conservation easements on its own lands and to forge agreements with federal agencies that allow recreational use that will create economic opportunities for shareholders, such as in tourism and sport fishing.

Metrokin said the corporation wants to work with shareholders to develop the local tourism infrastructure. Eventually Koniag might share in the profits.

ANCHORAGE DAILY NEWS
AUGUST 7, 1999

Easement protects stream character

KENAI — Eight acres at the junction of Soldotna Creek and the Kenai River are to be preserved as wildlife and fish habitat under an agreement that closed this week. The state Department of Fish and Game bought the land from the Francis E. Mullen Trust using $100,000 in settlement money from the Exxon Valdez oil spill. "There is an interesting twist," said Brad Meiklejohn, Alaska representative for the Conservation Fund, based in Arlington, Va., which served as an intermediary in negotiations that led to the deal. "The state gets fee ownership, but Kachemak Heritage Land Trust gets a conservation easement." Soldotna's Peggy Mullen said her parents, Marge and Francis Mullen, homesteaded the area in 1947 and took title in 1948. Her mother still lives on the homestead. Her father died several years ago. A few silver salmon follow the creek to Mackeys Lakes, she said. Black bears travel the creek bed at night. The conservation easement granted to the land trust bans subdivision of the land, storage of hazardous materials, construction of roads, parking lots and buildings, and other development that would destroy the natural character of the area.

CLARION PENINSULA
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EVOS cash buys land

By DOUG LOSHBAUGH
Peninsula Clarion

Eight acres at the confluence of Soldotna Creek and the Kenai River are to be preserved as wildlife and fish habitat under a deal that closed Tuesday.

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Soldotna's Peggy Mullen said her parents, Marge and Francis Mullen, homesteaded the area in 1947 and took title in 1948. Her mother still lives on the homestead. Her father died several years ago in Ireland. Her brother Frank played the major role in negotiating the sale and conservation easement, she said, and her mother plans to place a second conservation easement on her land, which lies upstream on Soldotna Creek, so that will never be developed either.

"My dad had expressed the desire to preserve that land in its natural state," Mullen said. "The creek bottom should be reserved for salmon and bears. When I was a child, side-by-side, their backs sticking out of the water, were king salmon. There were silvers, too."

A few silver salmon still follow the creek to Mackeys Lakes, she said. Black bears travel the creek bed at night.

"We rarely see brown bears, but one did pass by last year," she said.

Mullen said trespassers have been fishing illegally from the property and damaging the bank along the Kenai River. To stop the damage, she has been forced to shoo them away.

"We're hoping that the state will take good care of the land," she said.

Dave Athons, assistant area biologist for the Division of Sport Fish

See LAND, back page

...Land

Continued from page A-1

in Soldotna, said he expects Fish and Game will close the property to bank fishing during the height of the sockeye salmon run.

The conservation easement granted to the land trust bans subdivision of the land; storage of hazardous materials; construction of roads, parking lots, and buildings; and other development that would destroy the natural character of the area.

However, the Mullen trust reserved the right to build a small science center and pedestrian trails on the property and stabilize the banks of the Kenai River as approved by Fish and Game. The trust also reserved the right to extract subsurface oil and gas by directional drilling from adjacent land or other means that do not hurt the conservation values of the property.

The easement also allows construction of a small parking area for the science center.

Mullen said the science center parking lot will have handicapped parking and parking spaces for two or three staff. However, the center will be accessible only by trail. It could support creek education projects, water testing and studies of streams and lakes, she said.

The land trust was interested in a conservation easement on the land because of its proximity to Soldotna Creek Park and its location on the Kenai River, said Ole Andersson, the group's Kenai River region director. The prime goal is to preserve salmon and wildlife habitat, he said.

"We'll monitor the property on a yearly basis to make sure that the agreements that have been made are kept," he said.

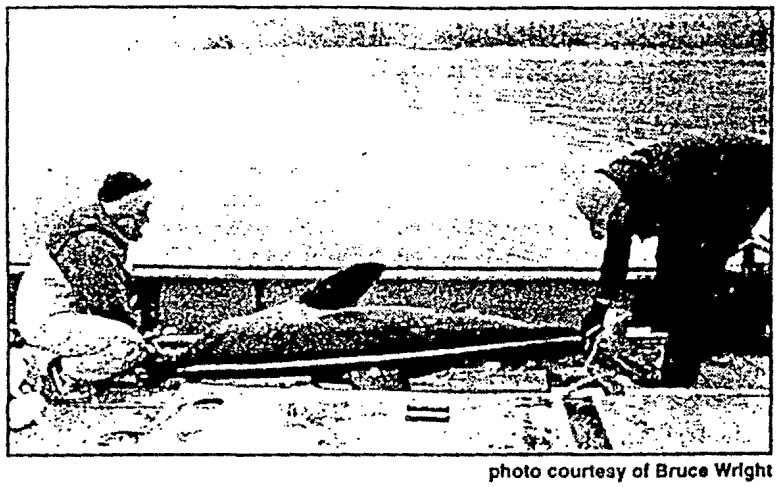

photo courtesy of Bruce Wright

Barbara Block, a professor at Stanford University, and Bruce Wright, of the National Oceanic and Atmosphere Administration, measured a salmon shark caught in the waters of Port Gravina July 26.

Pesky salmon sharks catch eye of scientists

By Alberto Cagliano
The Cordova Times

A sunny, windless day, with fish running thick and the boat's engine chugging smoothly along, is a fisherman's ultimate dream.

Bill Webber Jr., a Cordova commercial fisherman, was not far from such a pleasant situation a couple of weeks ago. But he said he had to cut short a good 48-hour opener after salmon sharks cut huge holes in his gillnet, making it unusable.

"I managed to save the cork line, but the web was gone," he said. "It is something you expect at least once every season."

An Alaska Department of Fish and Game biologist reported that purse seiners did not fare better on a recent opener in Port Fidalgo. Sharks were so thick that there was no way to make a single set.

Lamna ditropis, the scientific name of salmon shark, has become a common sight in the waters of Prince William Sound and a major nuisance for fishermen who often end up having to replace a $1,200 gillnet.

The fish also caught the eye of a group of scientists who spent the month of July studying birds and fish species in Prince William Sound.

The Alaska Predator Ecosystem Experiment decided to add salmon sharks to other fish being studied when they became a common bycatch while researchers were sampling juvenile herring.

"We caught sharks while sampling young herring and we noticed that sharks were eating them," said APEX manager Bruce Wright.

Wright is a National Oceanic and Atmospheric Administration officer based in Juneau. He is also the chief of the office of Oil Spill Damage Assessment and Restoration.

The growing number of sharks, the impact they may have on the Sound's herring population and the lack of scientific information convinced Wright to include salmon sharks in the study.

He said the project's main focus was the relationship of sealife, with birds seen as predators. But salmon sharks seemed to fit in the picture just as well.

APEX is funded by the Exxon Valdez Oil Spill trustee Council at $2 million a year. It involves federal and state agencies, several universities and research centers.

Wright said the study on salmon sharks tries to understand their diet, pupping habits, population and where they winter.

He said reports from fishermen and pilots show an increase in shark numbers over the past seven years.

"Twenty years ago fishermen would see few a year," he said. "There may be thousands of salmon sharks in Prince William Sound. They tend to concentrate in the bays," he said.

Their known habitat extends from the Gulf of Alaska to the Oregon coast. They can grow up to 12 feet, but those in Prince William Sound average 6-7 feet, Wright said. They are very beamy in shape, with a girth of about 6 feet.

What is being discovered on their physiology makes them a very peculiar species among the 400 known sharks.

Wright said they are one of only six shark species to have warm body temperature. They have a high metabolism and manage to keep their muscles, eyes and brain warm.

A heat-transfer system that is still being investigated, transfers blood heat to the body before the bloodstream reaches the gills.

Wright said he and the other scientists caught and studied about 70 sharks, luring them into a seine net with anchovies.

After being hoisted aboard, the sharks are measured, tissue is taken for genetic classification and the contents of their stomach is analyzed.

They can eat almost anything they find, Wright said. But they appear to follow salmon runs and often prey on squid, pollock, rockfish and herrings.

Researchers also attached Alaska Department of Fish and Game tags to their dorsal fins and inject them with tetracycline. The substance fixes on the fish's vertebrae as a fluorescent layer and allows scientists to determine age if the sharks are recaptured.

Fishermen who catch a tagged salmon shark should bring its stomach, vertebrae and tag to Fish and Game, he said.

For the moment, Wright said the project has no funds for a recapture project.

Sampling takes three to four minutes.

"They are very combative when they come out of the water, but for some reason they calm down as soon as a researcher gets on top of them," he said.

Matt Miller, a Fish and Game sportfish biologist, said sport fishing for sharks has been growing in popularity in the Prince William Sound and around Cordova.

Fish and Game held a commercial salmon shark fishery in Prince William Sound and Cook Inlet two years ago. But because little is known about the species, management tended to be conservative, Miller said.

The Board of Fisheries decided to close the fishery in 1997 fearing dwindling numbers because of the shark's low reproductive rates.

Salmon shark's relationship to sea life being studied

By Alberto Cagliano

The Cordova Times

A sunny, windless day, with fish running thick and the boat's engine chugging smoothly along, is a fisherman's ultimate dream.

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THE CORDOVA TIMES
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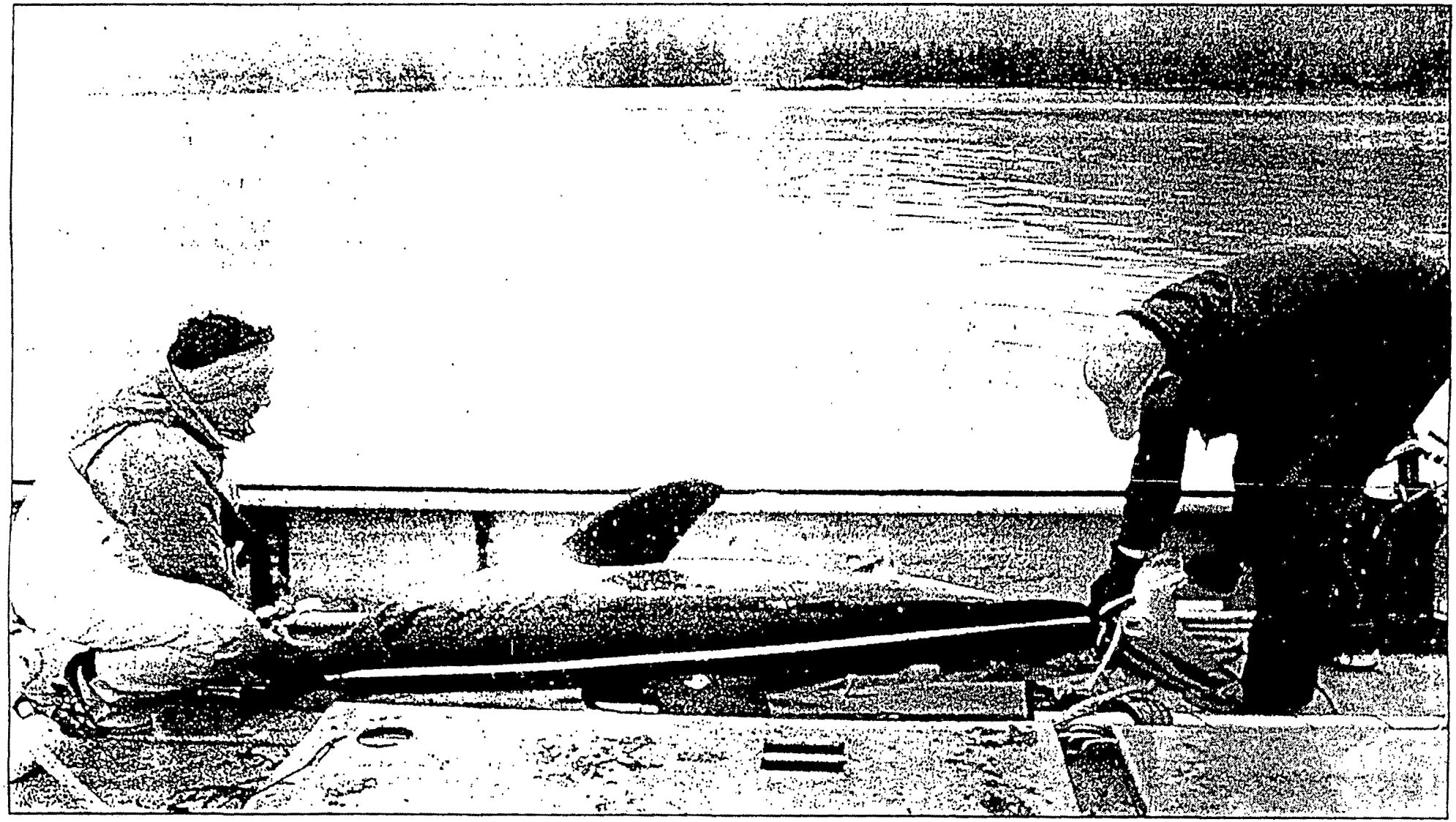

Photo courtesy Bruce Wright

Barbara Block, a professor at Stanford University, and Bruce Wright, of the National Oceanic and Atmosphere Administration, measure a salmon shark caught in the waters ort Gravina July 26.

San Francisco
Chronicle
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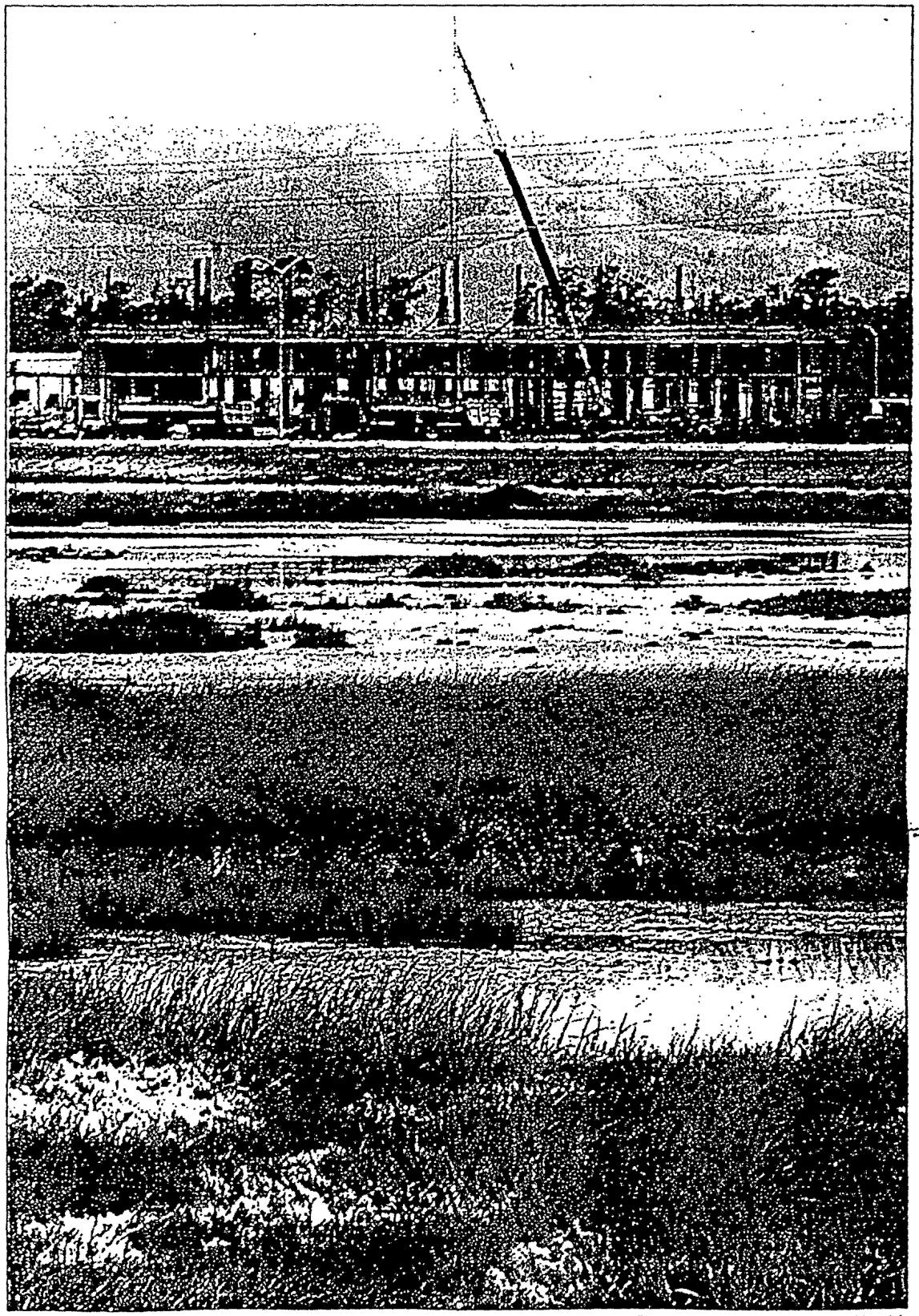
Our Poisoned Bay



Photos by MICHAEL MALONEY */ The Chronicle*

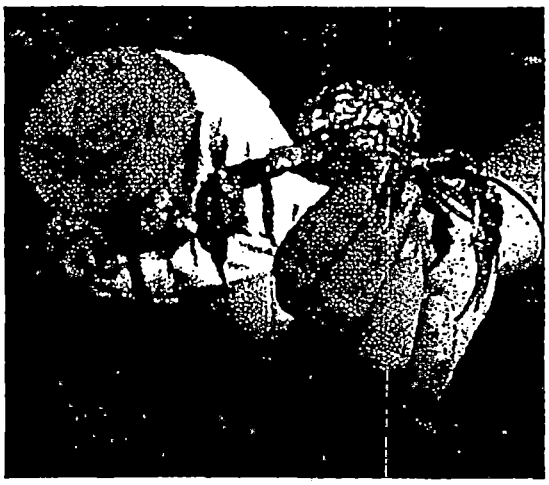
New construction near the San Francisco Bay National Wildlife Refuge near Newark has encroached on the wetlands. Experts maintain that expansion of these wetlands is necessary for the restoration of the bay.

Despite end to direct piping of sewage, pollution worse now than 30 years ago

By Glen Martin
CHRONICLE STAFF WRITER

The not-so-halcyon days when San Francisco Bay reeked like a festering garbage dump are over.

Municipal sewage and industrial waste no longer pour directly into the estuary. Today, thanks to tough environmental regulations enacted during the past 30 years, bay waters are relatively clear and sweet-smelling.



Cristina Grosso (background) and a colleague from the San Francisco Estuary Institute found a green crab at Robert Crown State Beach in Alameda. Once a month, researchers collect specimens from the tidal flats to determine the health of the ecosystem.

But many species of fish and wildlife are in steep decline. The big cleanup has done little to improve their fortunes. Indeed, the bay was far richer in fish 30 years ago — when it stank to high heaven — than it is now.

The problem, scientists say, is that the bay is suffering from millions of tiny, diffuse sources of pollution. Considered separately, each is small, even inconsequential. But collectively, they are doing serious damage.

Oil and gas spilled on streets, pesticides from farm fields and backyard lawns, polychlorinated biphenyls and dioxin buried in soil at thousands of small, contaminated sites — they all flow downhill with the winter rains, ending up in estuaries and the ocean.

And as the population expands, the problem worsens. These phantom sources of pollution have emerged as one of the most serious threats to San Francisco Bay, and scientists say that traditional pollution controls may be inadequate to deal with them.

"San Francisco Bay is a catch basin for a huge area, from Redding in the north on the Sacramento River to Fresno in the south on the San Joaquin River," said Stanley "Jeep" Rice, a senior toxicologist with the National Marine Fisheries Service.

"Then you have this incredibly urbanized area immediately around the bay and Delta," Rice said. "Every time you have a rain, you get a huge pulse of petrochemicals into the system."

The policy wonk's term for the problem is "nonpoint" pollution. Basically, that is any toxic substance that does not originate directly from a pipe.

Rainer Hoenicke, an environmental scientist with the San Francisco Estuary Institute, an East Bay organization that monitors the health of the bay-Delta system, said "point" sources of water pollution — pipe discharges — have been regulated to the degree that additional controls would provide little benefit.

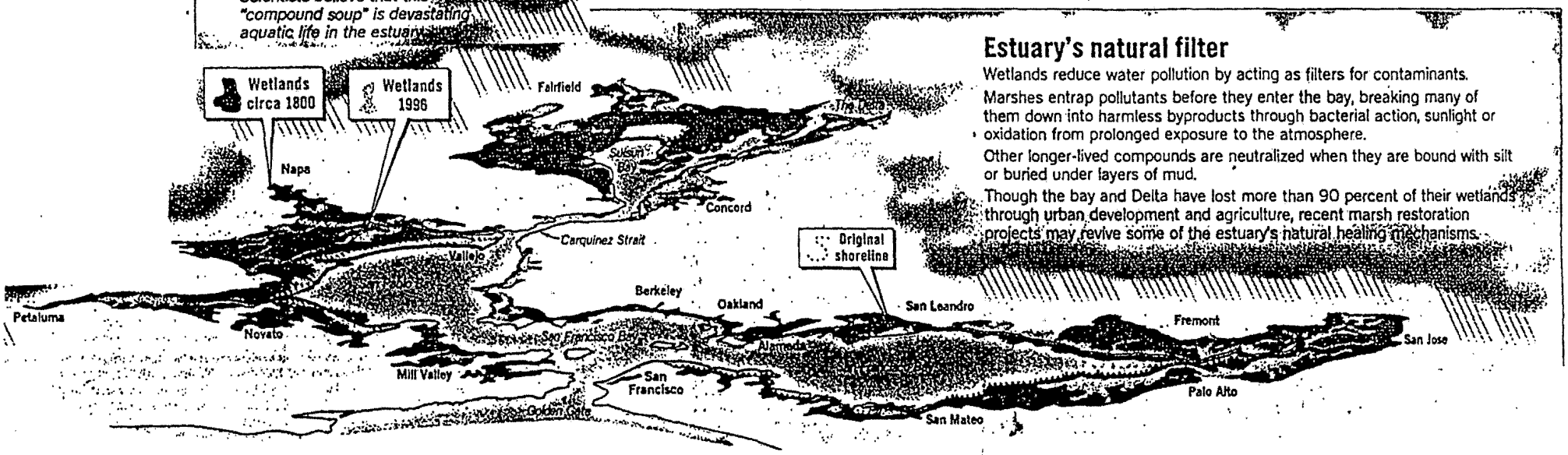
"Our concern has basically shifted to nonpoint," said Hoenicke, "and that covers a very wide area. It's all the urban runoff

▶ **ECOSYSTEM:** *Page A6 Col. 1*

DEADLY RUNOFF

The Bay Area's heavily urbanized landscape is constantly contaminated from small oil and gas spills, home pesticide use and pollutants from car exhaust, factories and refineries.

Whenever it rains, the bay and Delta are infused with a toxic brew delivered by storm drains and highway medians. Scientists believe that this "compound soup" is devastating aquatic life in the estuary and the



Estuary's natural filter

Wetlands reduce water pollution by acting as filters for contaminants.

Marshes entrap pollutants before they enter the bay, breaking many of them down into harmless byproducts through bacterial action, sunlight or oxidation from prolonged exposure to the atmosphere.

Other longer-lived compounds are neutralized when they are bound with silt or buried under layers of mud.

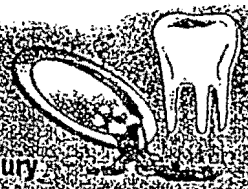
Though the bay and Delta have lost more than 90 percent of their wetlands through urban development and agriculture, recent marsh restoration projects may revive some of the estuary's natural healing mechanisms.

Pesticides

Banned pesticides such as DDT and dieldrin continue to pollute the bay and contaminate marine life. Of even greater concern these days are organophosphates, such as Diazinon.

Most organophosphates break down rapidly in the environment, but Diazinon is much more long-lasting. Tons of it are used in Central Valley croplands, and it is an extremely popular household poison for garden pests and ants.

Diazinon is known to kill or stunt marine life and is particularly devastating to crustaceans, such as shrimp. After rainstorms, toxic "pulses" of Diazinon have been measured in the Sacramento River and Carquinez Strait.



Mercury

Mercury is a heavy metal that accumulates in tissue. It has been a contaminant in the bay since the Gold Rush, when tons of the silvery liquid element were used to separate gold from ore in the Sierra.

Much of that "legacy" mercury sluiced into the bay, where it continues to contaminate fish and pose a health threat to people who catch and eat them.

An unknown quantity of mercury also enters the bay yearly from car exhaust, abandoned mercury mines in the South Bay and northern coastal mountains, discarded products that contain mercury and dental offices where mercury-containing amalgam filling material is used.

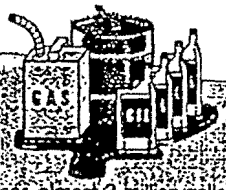
Several species of bay fish have been found to exceed the state safety threshold for mercury.

Dioxin

Possibly the most toxic substance known, dioxin is suspected of causing cancer, birth defects and reproductive problems at infinitesimally low levels.

As with mercury, there are problems with legacy quantities of dioxin in the bay, the result of lax pollution laws before the 1980s. Today, the amount migrating to the estuary is greatly reduced — but 2 to 4 grams still filter into the water annually, primarily from diesel exhaust and refineries.

Dioxin bioaccumulates in tissue and is considered a serious contaminant in fish. In San Francisco Bay, white croaker appear to have particularly high levels of dioxin.

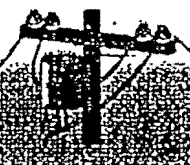


Oil

Every year, almost 3 million gallons of oil flush into the bay or the San Joaquin and Sacramento rivers from streets and highways.

The oil is broken down by the sun and air, leaving a heavy residue of chemicals that can be toxic to aquatic life even at very low levels. Scientists think these chemicals, called polyaromatic hydrocarbons, or PAHs, may be reducing fish populations in the bay and Delta.

PAH water concentrations consistently register above the state safety threshold in many locations, most notably the San Jose area, the Dumbarton Bridge, Alameda, the Napa River and the Petaluma River.



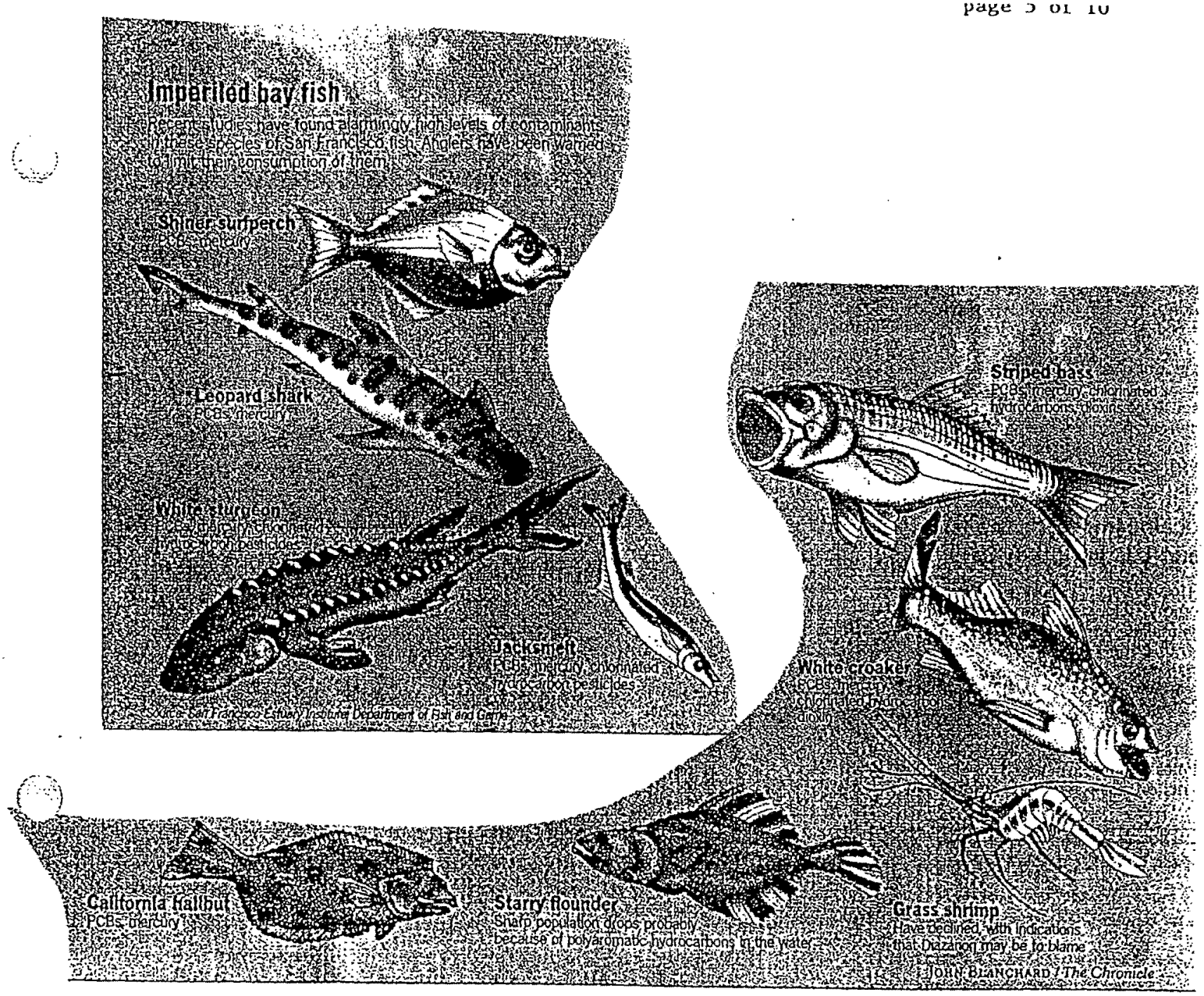
PCBs

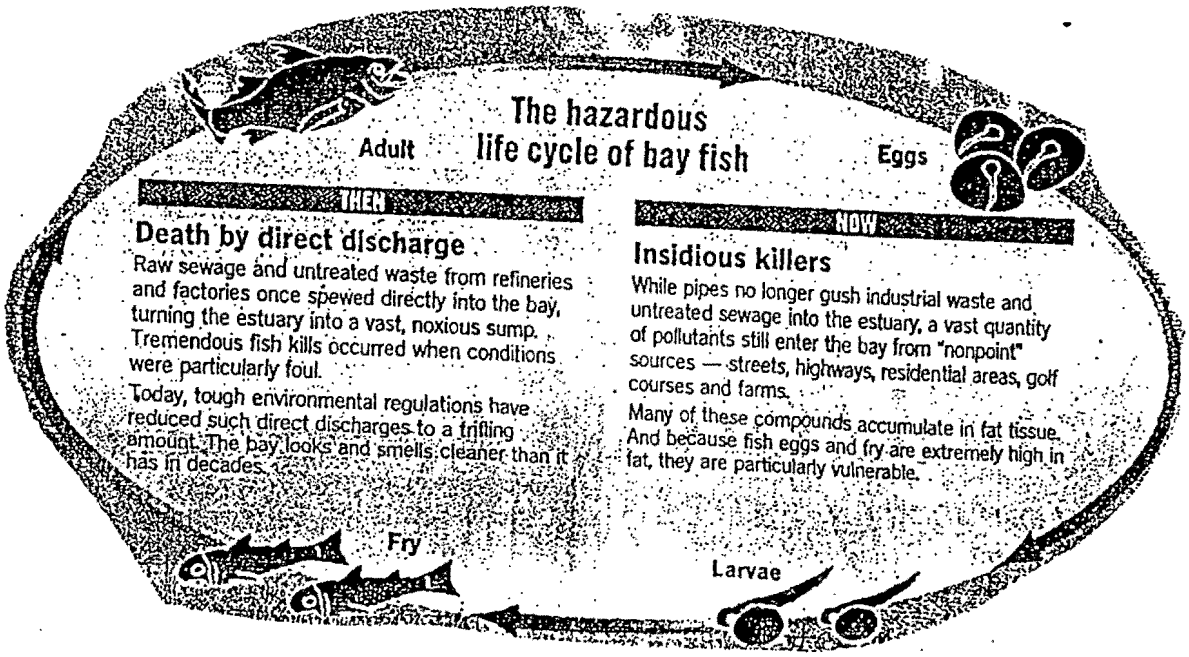
These long-lived oily substances were once used as an insulating material in electrical transformers. Banned in the 1970s, polychlorinated biphenyls in the bay appear to be gradually decreasing.

They are still a problem, however, inasmuch as they accumulate in fat tissues in a manner similar to dioxin and chlorinated hydrocarbon pesticides.

PCBs remain a serious pollutant for bay fish. At least seven species have shown tissue levels above the level considered safe for human consumption. Shiner surfperch and white croaker show particular susceptibility to PCB contamination.

There are numerous toxic "hot spots" in the Bay Area that are presumed to be leaking PCBs into the soil and water.


Imperiled bay fish
Recent studies have found alarmingly high levels of contaminants in these species of San Francisco fish. Anglers have been warned to limit their consumption of them.
Shiner surfperch
PCBs, mercury
Leopard shark
PCBs, mercury
White sturgeon
PCBs, mercury, chlorinated hydrocarbon pesticides
Jacksmelt
PCBs, mercury, chlorinated hydrocarbon pesticides
Striped bass
PCBs, mercury, chlorinated hydrocarbons, dioxin
White croaker
PCBs, mercury, chlorinated hydrocarbons, dioxin
California halibut
PCBs, mercury
Starry flounder
Sharp population drops probably because of polyaromatic hydrocarbons in the water
Grass shrimp
Have declined, with indications that Diazanon may be to blame
Source: San Francisco Estuary Institute, Department of Fish and Game
JOHN BLANCHARD / The Chronicle


The hazardous life cycle of bay fish
Adult
Eggs
THEN
Death by direct discharge
Raw sewage and untreated waste from refineries and factories once spewed directly into the bay, turning the estuary into a vast, noxious sump. Tremendous fish kills occurred when conditions were particularly foul.
Today, tough environmental regulations have reduced such direct discharges to a trifling amount. The bay looks and smells cleaner than it has in decades.
NOW
Insidious killers
While pipes no longer gush industrial waste and untreated sewage into the estuary, a vast quantity of pollutants still enter the bay from "nonpoint" sources — streets, highways, residential areas, golf courses and farms.
Many of these compounds accumulate in fat tissue. And because fish eggs and fry are extremely high in fat, they are particularly vulnerable.
Fry
Larvae

Millions of Solutions to Reclaiming Polluted S.F. Bay

▶ **ECOSYSTEM**

From Page 1

immediately around the bay, all the pesticides and herbicides from both homes and farms. It includes aerial deposition of chemicals. It's all the sources that don't lend themselves to easy control or regulation."

Although nonpoint sources are diffuse by their very definition, their cumulative effect can be huge.

Rice and a group of his fellow fisheries service scientists determined that the average American annually puts a little more than a quart of petroleum products on roads and parking lots from leaky crankcases and exhaust emissions.

That means that the 11 million people who live in the 31 counties that border San Francisco Bay or the rivers that ultimately flow into it collectively, if indirectly, dump about 2.97 million gallons of oil a year into the the watersheds that feed the bay-Delta system. (By comparison, the Exxon Valdez oil spill was about 11 million gallons.)

"And that happens year in and year out," said Rice.

Worries about nonpoint pollution sharpened recently with a study led by Rice that found minute quantities of oil can devastate fish eggs and larvae. The study was initiated to determine the long-term effects of the 1989 Exxon Valdez oil spill on Alaska's Prince William Sound, but the startling results may be more relevant to urban estuaries such as San Francisco Bay.

"We found that long-term exposure to oil in the parts per billion range produced significantly more egg mortality, more deformities in the fry and less adult survival than (fish) raised in an oil-free environment," Rice said.

"That was very surprising, because we were dealing with levels of oil on three orders of magnitude less than were previously considered toxic. Until our study, it was assumed you'd need oil in the parts per million range to see real problems."

MICHAEL MALONEY / *The Chronicle*

Fishers headed out to the end of the Berkeley Pier to try their luck despite warning signs cautioning them against the increasing toxicity of fish in San Francisco Bay.

Rice said San Francisco Bay is under unrelenting pressure from petroleum pollutants, and that the substances causing the most problems are polyaromatic hydrocarbons, or PAHs. These are the heavier compounds left from fuels and motor oil after lighter compounds such as benzene and toluene have evaporated.

"PAHs are resistant to bacterial

degradation, they are quite toxic, and they are not very soluble in water," said Rice. "But they are lipid (fat) soluble, and animals take them up in their fat. PAHs concentrate in marine organisms when those organisms are almost pure fat and at their most vulnerable – the egg and larval stages."

Bob Spies, a Livermore marine biologist who was the former chief scientist for the Exxon Valdez Oil Spill Trustee Council, said he finds the fisheries service report troubling, particularly in regard to estuaries near urban areas.

"It essentially supports work I did in the 1980s on starry flounder in San Francisco Bay, where we found that fish that had high levels of an enzyme associated with PAH exposure had reduced egg fertility and increased (fry) mortality," said Spies. "Since that study, other scientists I talk to tell me starry flounder have become rare in the bay. They once were very common."

It is not only PAHs that are a nonpoint pollution problem – polychlorinated biphenyls, or PCBs, and dioxin are also poisoning the bay.

PCBs are long-lasting compounds that are solid in their pure state but easily soluble in fats, oils or solvents. Banned in the 1970s, polychlorinated biphenyls were widely used for insulation in electrical transformers and capacitors. Soils have been contaminated with PCBs in myriad spots around the Bay Area, and the compounds wash easily into rivers and estuaries.

"PCBs are a real concern because they're slow to break down," said Spies. "Not too many of them are released into the environment these days, but the ones that are already out there represent a significant quantity."

Like PAHs, PCBs have been associated with decreased fertility in fish, said Spies.

Dioxin is another worry. One of the most toxic compounds known, minute amounts can cause cancer and reproductive disorders. Several species of San Francisco Bay fish contain enough dioxin – as well as other contaminants – to make their consumption a public health concern.

Dioxin is a byproduct of the manufacture of certain pesticides. It is also formed in combustion processes involving fuel that contains both chlorine and carbon. The burning of diesel fuel, coal or wood results in the formation of dioxin.

In the past, much of the dioxin that got into the bay probably came from now-banned pesticides and industrial waste discharges. Today, most comes from diesel exhaust.

Recently, the Oakland City Council and the San Francisco Board of Supervisors voted to support a regional plan calling for the complete elimination of dioxin discharges into the bay. But given current sources of the compound, achieving such a goal will be difficult.

As with polychlorinated biphenyls, not much dioxin is estimated to flow into the bay – about three grams a year. But like PCBs, dioxin is extremely long-lasting and can move about freely in the environment.

"Intuitively, that doesn't seem like much," said Brian Bateman, the air toxics manager for the Bay Area Air Quality Management District. "But it's extremely toxic, and we also have to deal with 'reservoir' sources – the dioxin that got into the bay years ago."

Mercury is another contaminant that has had a long and troublesome history in the bay. The element is profoundly harmful to both human beings and wildlife.

During the 19th century, huge quantities of it were flushed into the estuary from the Sierra, where it was used to separate ore from gold. This "legacy" mercury is still tainting San Francisco area fish and wildlife. And environmentalists say the heavy metal continues to seep into the bay on a continuing basis from myriad sources.

"There are more than 300 inactive mercury mines in the coastal foothills that have large exposed tailings piles," said Michael Belliveau, the director of Just Economics for Environmental Health, a San Francisco group concerned with Bay Area mercury contamination.

"Mercury leaches from them continually," Belliveau said. "It's also released from fuel combustion in cars and at refineries, cement kilns and power plants. It's in silver amalgam fillings, so it gets into the sewage system from dentists' offices. It's in fluorescent lights, camera and watch batteries and certain electrical switches."

Bad as it is, the quantity of mercury seeping into San Francisco Bay has been reduced since the late 1800s. PCB and dioxin flows have also been cut.

But the same cannot be said of pesticides.

DDT and dieldrin, which have been banned for decades, continue to pollute bay fish. Both compounds – known as chlorinated hydrocarbon pesticides – are extremely stable and take decades to degrade. Yet DDT tissue levels in local fish appear to be gradually decreasing.

Of greater concern these days are organophosphate pesticides. Organophosphates replaced the earlier pesticides, promoted as short-lived compounds that would break down

▶ **ECOSYSTEM:** *Page A7 Col. 1*

MONDAY, AUGUST 2, 1999

Bay in Worse Shape Than 30 Years Ago

▶ ECOSYSTEM
From Page A6

quickly when exposed to sunlight and soil.

Tons of organophosphate poisons get into the bay each year — not just from farms in the Central Valley, but from golf courses and the lawns and gardens of the thousands of homes ringing the estuary. Experts say pesticides are often applied more heavily in and around homes than on commercial crops.

But "some of the organophosphates don't break down as quickly as promoted," said Spies. "At least one, Diazinon, is a serious contaminant in the bay. It's used in agriculture and around the home to control fleas and ants."

Spies explained that organophosphates kill insects by interfering with an enzyme that aids in the transmission of nerve impulses. "Unfortunately, shrimp and numerous other marine animals are biologically similar to insects, so it affects them as well," he said.

A 1993 study by the U.S. Geologic Survey concluded that large "pulses" of Diazinon flow through San Francisco Bay from the Sacramento and San Joaquin rivers after major storms.

Concentrations of the pesticide in bay water can be alarmingly high during such events — as much as 199 nanograms per liter. Although a nanogram is only one-billionth of a gram, the National Academy of Sciences has issued guidelines stipulating that maximum Diazinon concentrations should not exceed nine nanograms per liter of water if aquatic life is to thrive.

Ultimately, the problem is not simply PAHs or PCBs or Diazinon or dioxin, say scientists. It is probably all of them combined, each working in malign concert with the other.

Unfortunately, research is scant on the cumulative effects of the various toxic compounds circulating in urban estuaries.

"A lot of the available research money is going to the examination of short-term impacts" of specific chemicals, said Spies. "We're not looking at the long-range implications of the entire soup of compounds out there in the bay."

One thing is clear about San Francisco Bay: For whatever reason, marine life has been greatly reduced. Rice thinks "compound soups" may gradually depress fish populations to the point of no return.

"You don't see the huge fish kills that you used to get in the old days from sewage spills or big industrial releases of chemicals," he said. "But these compounds appear to be acting at the larval and egg stages, so you get less and less recruitment with each generation of fish. They just kind of fade away. And then fishermen suddenly start wondering why they aren't catching anything."

What can be done to restore fish populations? Rice thinks healthy wetlands are essential in reducing the effects of polluted runoff.

"Wetlands are filters," he said. "They remove and degrade all sorts of toxic compounds. The more wetlands you have around a bay, the more filtration you get."

That line of thinking is gaining ground. Recently, a federal and state task force called for creating 60,000 acres of new tidal marshlands to revitalize bay ecosystems.

Local pollution experts suggest other remedies as well.

"Education is the first step," said Geoff Brosseau, executive director of the Bay Area Stormwater Management Agencies Association, a regional organization of 90 city, county and special district jurisdictions that promotes programs to reduce nonpoint pollution to the bay.

"We're dedicated to raising public awareness," said Brosseau. "Basically, this is a matter of 6 million little pollution sources — every one of us who lives around the bay contributes to the problem, and we'll only solve it when we each do our part."

Minimizing driving and keeping cars maintained to reduce crankcase drips and exhaust emissions are crucial, said Brosseau, as is curtailing excessive pesticide, herbicide and fertilizer use around homes and gardens.

Changes in basic infrastructure could also help significantly, said Brosseau. "We need to plan for water quality when we develop," he said. "Wherever possible, storm drains should be directed to bypasses."

Bypasses are areas of open land where runoff is diverted. Although they are typically employed for flood control, they can also be used to improve water quality. When contained in shallow impoundments of standing water, toxic compounds tend to degrade.

"We can designate open areas in cities and suburbs as small bypasses," said Brosseau. "Freeway medians should be concave instead of convex, so water will collect rather than run off. This allows microbes and sunlight to degrade toxic compounds before they get into the bay."

Wil Bruhn, a senior engineer with the San Francisco Bay Regional Water Quality Board, said the problem of nonpoint pollution is confounding simply because it is caused by millions of people involved in the daily, mundane process of living their lives – driving their cars, caring for their lawns, consuming products.

"For example, we've determined that the biggest source of copper – a serious pollutant in the bay – is now coming from brake pad dust," Bruhn said. "It used to be industry that was the biggest source. And when it was industry causing the problem, it was easy to regulate – we issued discharge standards. But regulating millions of brake pads is much harder."

After 30 years of hard work, environmentalists and regulators alike hoped that there would be a big payoff for the bay – that the fish and wildlife would return to waters that no longer stank, that were no longer mottled by mysterious slicks and scum.

But the payoff never happened – and a growing number of scientists think the reason is small but persistent quantities of toxic compounds. And they believe that a completely new approach to pollution control is necessary to address them.

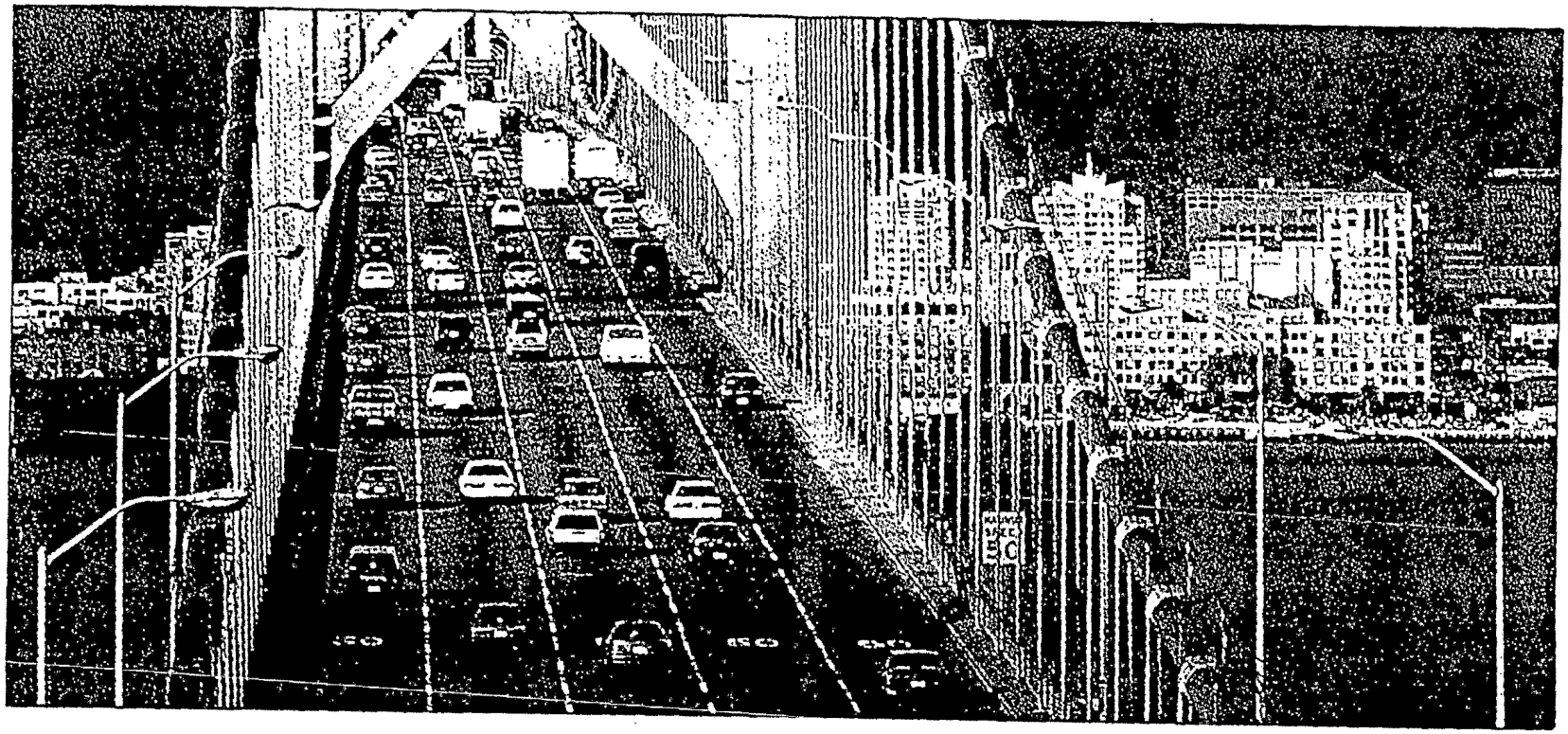
"The whole toxic paradigm has changed," Rice said. "It's not a matter of all or nothing. If you have trace levels of compounds in the water that are killing 5 to 10 percent of the eggs and young fish each year, you're still going to come to a point when you have no fish. You'll still end up with an empty system."

REDUCING POLLUTION

Pollution in San Francisco Bay has several million causes — it exists because of the activities of the several million people who live around it. So it requires several million solutions. The problem seems daunting, but environmental authorities insist that individual and community action can make a significant, positive difference. Among their recommendations:

- Bring your car to a certified dealership or garage for oil changes, or return used oil to established recycling centers if you perform your own maintenance.
- Have your car checked periodically to make sure it is not dripping oil or producing excessively dirty exhaust.
- Ride a bike or walk whenever possible.
- Use the minimum amount of pesticide necessary for your home and garden. Garden organically whenever possible.
- Compost garden and kitchen waste. Compost can be used as a fertilizer, reducing nitrate runoff from artificial fertilizers. Composting also saves landfill space.
- Do not overwater lawns and gardens. Overwatering can flush large quantities of pesticides and fertilizer directly into storm drains.
- Wash your car at commercial car washes. They use less water than is typically used at home, and the water is usually contained for treatment.
- Use manual or electric lawn mowers and garden tools whenever possible. Gas-powered lawn mowers, chain saws and hedge trimmers contribute to short-term air pollution, and their combustion byproducts contain nasty toxic substances that can eventually settle into waterways.
- Purchase products that are low in toxic elements such as mercury.
- Encourage your city to purchase buses and service vehicles that use clean fuels such as propane, rather than diesel.
- Promote community and county zoning regulations that require new developments to construct minibypasses and settling areas that slow water discharge into rivers and estuaries.

– Glen Martin



MICHAEL MALONEY / *The Chronicle*

The average American puts about a quart of oil on the roads and parking lots yearly; for the bay, that amounts to 2.97 million gallons.

Natives may agree to conservation easement

ANCHORAGE (AP) — Chugach Alaska Corp. may be willing to forego logging on its land near Cordova, but an official with the Native corporation said no decision would be made until the U.S. Forest Service grants it a road easement through the Chugach National Forest.

Agreeing to a conservation easement, strongly advocated by environmentalists and the Clinton administration, would give the regional corporation perhaps tens of millions of dollars for investment. But it would mean Chugach's 73,000 areas near Carbon Mountain could not be developed.

If a conservation easement were sold to the federal government, the forest road Chugach wants permission for would not be built. There are indications, however, that getting the Forest Service's clearance for the road first would make the timberlands more valuable because it would make the prospect of logging more imminent.

Chugach Alaska board chairman Sheri Buretta, testifying in Washington, D.C., at a House Resources Committee hearing on legislation mandating the road easement, insisted Wednesday that "our land is not for sale."

But later she appeared to qualify that statement. She said the corporation is "not in a position to give any consideration" to a conservation easement until the road easement is issued.

Chugach's timberlands are in what environmentalists consider one of the most significant parcels of undisturbed wetlands in North America.

The Interior Department agreed in 1982 to give the property to the Chugach regional corporation in settlement of its land entitlements under the Alaska Native Claims Settlement Act.

Wednesday's hearing was on legislation introduced by Alaska Rep. Don Young to prod the Forest Service to sign a road easement.

He accused Forest Service officials in Washington of stalling.

Young also made clear during the hearing that he thinks Chugach Alaska should bargain for a conservation easement once the road easement has been issued, to maximize the property's value.

"Once they get full access and title to their lands, that's when negotiations should take place," Young said.

"Without access, the land might as well be on the moon."

Later, Chugach Alaska's attorney, Peter Giannini, estimated that the corporation would have to spend as much as $8 million to build a single-lane gravel road to reach the 8,000-acre tract of timber it proposes to cut.

Witnesses at the hearing said that land and conservation easements purchased from Native village corporations by the Exxon Valdez oil spill trustee council have ranged from $200 to $400 an acre.

At $400 an acre, the corporation's Carbon Mountain lands would be worth $29.2 million.

But Marilyn Heiman, Interior Secretary Bruce Babbitt's top Alaska aide, told the Anchorage Daily News that the Carbon Mountain property is outside the area affected by the 1989 oil spill and that using proceeds from the Exxon Corp.'s $900 million damage settlement would not be possible.

The only other large pot of money available for such a land purchase is the federal Land and Water Conservation Fund, which receives federal proceeds from offshore oil development.

Ron Stewart, the Forest Service's deputy chief for programs and legislation, testified that the agency is nearly finished working out terms of a road easement with Chugach Alaska.

He said the last obstacle is the corporation's refusal to sign an agreement that would keep the road open to public use along its full length.

Chugach Alaska said it would allow public use along all the roadway, but is hesitant to sign an agreement that would "federalize" the road easement and could open the door to lawsuits over its development and use.

PENINSULA CLARION
JULY 30, 1999

Spill council, Murkowski near investment deal

By DAVID WHITNEY
Daily News Washington Bureau

WASHINGTON — The trustee council responsible for spending the $900 million Exxon Valdez oil spill settlement is nearing an agreement with Alaska Sen. Frank Murkowski to free the unspent proceeds for investment.

If a legislative deal is reached, the council could seek higher rates of return — as much as 11 percent — than it gets now through a court-administered account, Molly McCammon, executive director of the council, told Murkowski at a Senate Energy and Natural Resources Committee hearing Thursday.

It would use the proceeds to underwrite research.

Congressional action is required to authorize the council to invest the money. Otherwise the settlement proceeds will remain in the court system.

The council has been seeking investment authority for two years, but Murkowski, committee chairman, has voiced concern that the interest earnings would only give the council more money to buy land.

Murkowski again raised his objection to land purchases Thursday, accusing the council of going on a real estate "spree," spending $416 million for nearly 650,000 acres in the area affected by the spill, stretching from Prince William Sound south and west beyond Kodiak.

But the council in March took steps to limit its land spending when it approved a long-term restoration plan dedicating most of the remaining money for research.

The restoration plan, and the council's investment request, has been endorsed by the Alaska Legislature. The state is an equal partner with the federal government on the trustee council.

Of the estimated $170 million the council expects to have in the bank after the Exxon Corp. makes the last settlement payment in 2001, only about $55 million would go for additional land purchases. As much as half that sum is reserved for a possible land deal on Kodiak with Koniag Corp. that has been under discussion for several years.

During a break in Thursday's hearing, McCammon said the research possibilities are enormous if the council can invest the money at higher rates of return.

"We are committed to doing research forever," she said. "Government and industry don't have the money to do this. This is an incredible opportunity."

McCammon said that the council has been meeting with Murkowski and that they are close to putting aside their differences to support the council's research-heavy restoration plan.

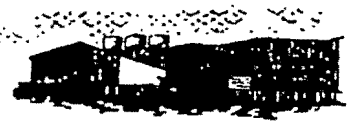
Asked after the hearing whether he thinks a deal is possible when the energy committee meets next week to work on the legislation, Murkowski said, "I think so."

According to McCammon, the delay in the investment authority has cost the council about $14 million in forgone interest, enough to fund an average-size research grant every week.

□ Reporter David Whitney can be reached at dwhitney@adn.com.

KODIAK DAILY MIRROR
MAY 12, 1999

Around Kodiak



Museum celebrates anniversary

Stop in for cake and festivities with the Alutiiq Dancers and a Native Art Raffle drawing at the Alutiiq Museum's 4th Anniversary celebration Thursday, May 13 located on 215 Mission Road at 5:30 p.m.

Admission is free all day. You can view the third annual Rural School Art Show or "Dolly Spencer: Inupiat Dollmaker."

The Alutiiq Museum and Archaeological Repository opened to the public in May of 1995. Built with a $1.5 million grant from the Exxon Valdez Oil Spill Trustee to the Kodiak Area Native Association (KANA). Continued support for the Alutiiq Museum comes from the Alutiiq Heritage Foundation, which includes: Afognak Native Corporation, Akhiok-Kaguyak Inc., KANA, Koniag, Inc., Leisnoi Inc., Natives of Kodiak, and the Old Harbor Native Corporation.

Call 486-7004 for more information.

Parcel ID: Larsen Bay 10-Acre Parcels
The Conservation Fund
EVOS Parcel Numbers 1092-1099, 2000-2007, & 2024

Rank: N/A **Acreage:** 163.64 **Agency Sponsor:** USFWS

Appraised Value: $254,000

Location: Uyak Bay, Kodiak Island

Landowner: The Conservation Fund

Address: 1800 North Kent Street, Suite 1120
Arlington, Virginia 22209-2156

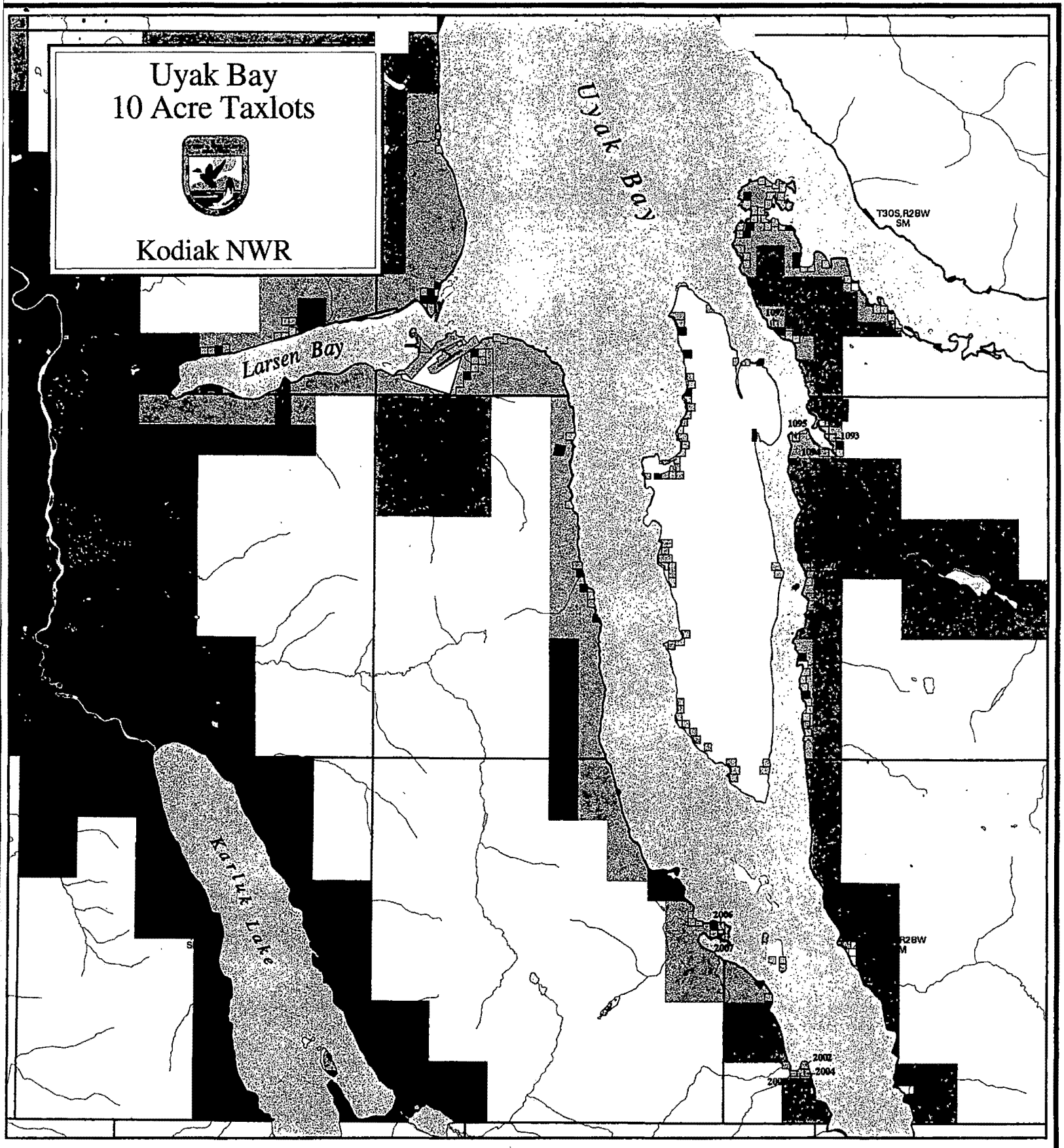
These seventeen parcels are located on the shoreline of Uyak Bay, south and east of Amook Island, within the Kodiak National Wildlife Refuge. They are portions of the land conveyed by Koniag, Inc., to the Larsen Bay Tribal Council, and further conveyed to tribal members. These parcels were conveyed by Tribal members to The Conservation Fund. The parcels are generally bounded by lands purchased by the United States from Koniag, Inc., through funding provided by the *Exxon Valdez* Oil Spill Trustee Council. These parcels would become part of the Kodiak National Wildlife Refuge. The accessibility and natural values of the properties give them significant development potential. These parcels have restoration benefits in their own right, though the greatest benefit of their acquisition may well be the elimination of highly developable inholdings with easy access. Incompatible development on these inholdings would markedly detract from the restoration benefits achieved by the major acquisition of the surrounding Koniag lands and create significant natural resource management problems for the Kodiak National Wildlife Refuge.

The shoreline locations results in a rich intertidal zone typical of the protected waters of Uyak Bay. Sea otters widely use the area. These parcels and the surrounding land and water are used by residents of the area for subsistence purposes primarily for hunting brown bear and Sitka black-tailed deer, harvesting salmon, and berry picking. Pink and sockeye salmon and dolly varden spawning streams run through the area entering Uyak Bay. The associated riparian habitat is used for nesting by harlequin ducks. Colonies of pigeon guillemots occur near the property, where they feed in near shore marine waters that also host marbled murrelets, wintering sea ducks and loons. There are several documented bald eagle nests within the area. The properties have not been intensively explored, but probably contain cultural sites based on the rich archeological resources of the lands bordering Uyak Bay.

Developments have been occurring on a number of tracts in the vicinity. These developments are generally cabins used for recreational and subsistence hunting and fishing. These sites have significant potential for expansion into more intrusive development. Continued development in this area could adversely impact water quality and fish and wildlife habitat. The acquisition of these parcels will help to preserve the wildlife, habitat, wilderness, recreational, and subsistence restoration benefits of the Koniag large parcel acquisitions and enhance sound natural resource management.

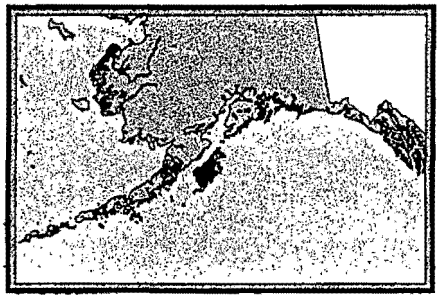
The Conservation Fund
10-Acre Parcels
Uyak Bay, Alaska

FWS #	EVOS #	Parcel Owner	General Location	Size	Appr Value	Current Status
90	1092	Conservation Fund	Amook Pass	9.69 acres	12,000	Purchase agreement signed
91	1093	Conservation Fund	Browns Lagoon	10.00 acres	12,000	Purchase agreement signed
92	1094	Conservation Fund	Browns Lagoon	13.17 acres	15,000	Purchase agreement signed-title problems
93	1095	Conservation Fund	Browns Lagoon	8.94 acres	18,000	Purchase agreement signed
94	1096	Conservation Fund	Amook Pass	10.00 acres	11,000	Purchase agreement signed
95	1097	Conservation Fund	Amook Pass	10.96 acres	15,000	Purchase agreement signed
96	1098	Conservation Fund	Amook Pass	9.28 acres	14,000	Purchase agreement signed
97	1099	Conservation Fund	Amook Pass	9.09 acres	15,000	Purchase agreement signed
98	2000	Conservation Fund	Amook Pass	10.74 acres	15,000	Purchase agreement signed
99	2001	Conservation Fund	South Uyak Bay	10.37 acres	20,000	Purchase agreement signed
100	2002	Conservation Fund	South Uyak Bay	8.34 acres	15,000	Purchase agreement signed
101	2003	Conservation Fund	South Uyak Bay	9.68 acres	16,000	Purchase agreement signed-title problems
102	2004	Conservation Fund	South Uyak Bay	7.02 acres	15,000	Purchase agreement signed
103	2005	Conservation Fund	South Uyak Bay	6.88 acres	18,000	Purchase agreement signed
104	2006	Conservation Fund	South Uyak Bay	8.52 acres	13,000	Purchase agreement signed
105	2007	Conservation Fund	South Uyak Bay	12.32 acres	14,000	Purchase agreement signed
132	2024	Conservation Fund	South Uyak Bay	8.64 acres	16,000	Purchase agreement signed
17 parcels				163.64 acres	$254,000	



Legend

- Native Corporation Owned
- Other Private
- Other Federal
- Conveyed Native Allotments
- KIB Owned
- TCF Owned
- Signed Argreements
- 10 Acre Taxlots
- US Acquired Native Allotments
- US Acquired Native Allotments With CE to State
- US Acquired Other Private
- US Acquired from Koniag With CE to State
- Koniag Owned/US Non Development Easement Expires 12/2/2001
- Lands Off Kodiak NWR



October 19, 1999