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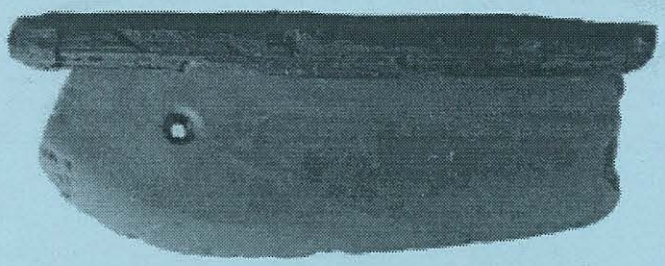
The *Exxon Valdez* Oil Spill Trustee Council's

Public Advisory Group



Kodiak Field Trip

September 10-11, 1997

with meetings in

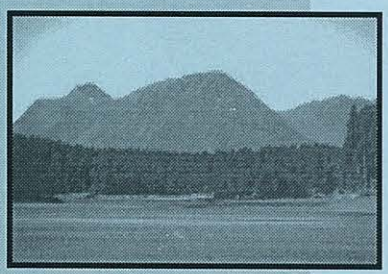
Kodiak

Larsen Bay

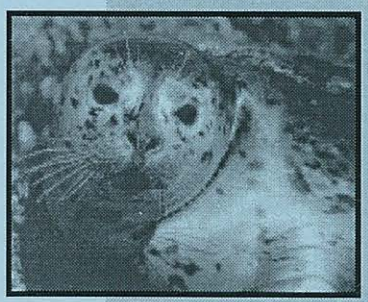
Old Harbor

Port Lions

Fisheries



Habitat Protection



Subsistence

Archaeology

Research & Monitoring

Recreation

CONTENTS

Field Trip Itinerary

Exxon Valdez Oil Spill Trustee Council
Public Advisory Group & Staff Kodiak Field Trip
Wednesday-Thursday, September 10-11, 1997

Sept 10

6:45 am	depart Anchorage Main Terminal, Era gate C4 aboard Charter DC3, includes Kodiak PAG members (beverage, snack en route) • Fly over Afognak/Shuyak Islands • Fly over Koniag lands (southern Kodiak)
10:00	arrive Kodiak - met by LaidLaw Bus, travel to Museum
10:30-11:45	Visit Alutiiq Museum, meet Kodiak PAG members - dropped off, bus back at 1:15 to travel to Fisheries Industrial Technology Center
noon-1:15 pm	**lunch** - *on your own*, meet bus at Orphium Theater (turquoise bldg)
1:30-3:00	Fisheries Industrial Tech Center - Near Island - dropped off. Board bus at 3:00 for travel to Ft. Abercrombie and Termination Point.
3:30-5:00	Visit Ft. Abercrombie and Termination Point - pick up Claire Holland on the way, bus stays, off load walking tour of some trails, view Termination Point from point in Fort, load back on bus to travel to Termination Point, (may off load there).
5:30-6:45	**dinner** - *on your own*, dropped off downtown, choose restaurant. Walk (up hill) to public meeting depends on weather and PAG. (If rainy, ride bus to public meeting.)
7:00-9:00	Kodiak public meeting - Kodiak Island Borough Assembly Chambers, Mill Bay Road, Rm 123

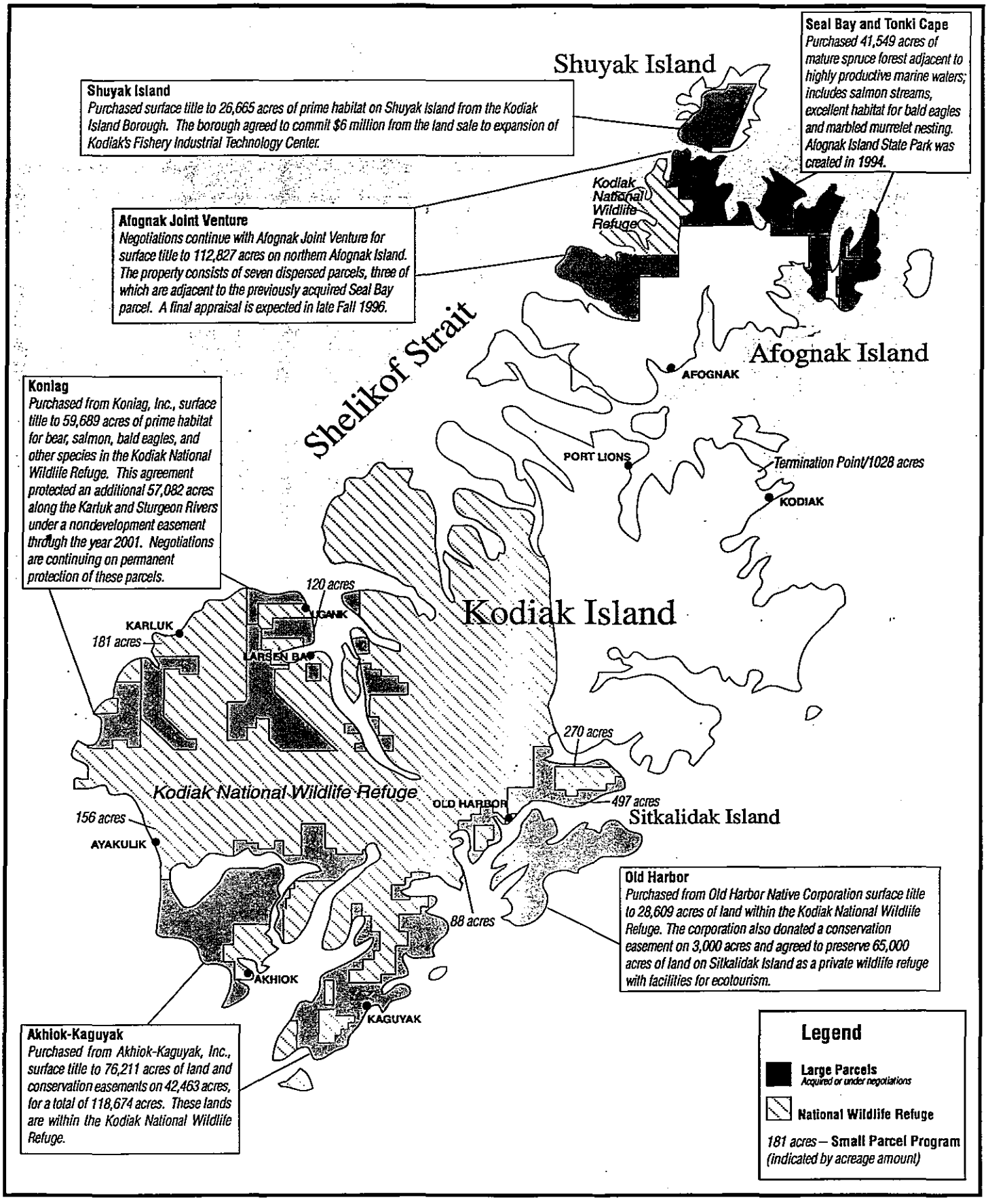
overnight in Kodiak --- Kodiak Inn

Sept 11

7:00-7:45 am	**breakfast** - *on your own*, suggest Chart Room at Kodiak Inn
8:00-11:00 am	Visit Long Island-boat charter - picked up by bus, travel to airport
11:30-3:30 pm	Divide into 3 groups fly out to Port Lions, Old Harbor (Island Air, municipal airport), Larsen Bay (Pen Air, state airport) • Tour communities • Open house with community (box **lunch**) Port Lions Tribal Council Office-1 pm City of Old Harbor Office-1 pm Larsen Bay Tribal Hall-noon
3:30	Depart Villages
5:35	Depart Kodiak - AK Airlines
6:35	Arrive Anchorage

MAP & RESTORATION UPDATE ARTICLE. DEC 1996

Kodiak-Afognak Archipelago



Exxon Valdez Oil Spill Trustee Council

Restoration Update

December 1996 / Vol. 3 No. 5

Kodiak

Restoration benefits island residents and wildlife

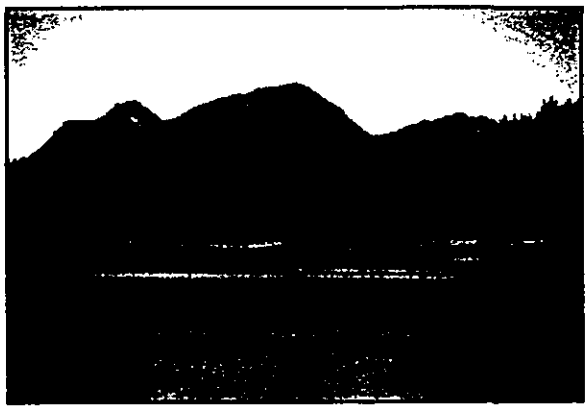
This is the second in a series of articles describing how Exxon Valdez criminal and civil funds are being invested in the spill region. The Cook Inlet region was covered in the October 1996 issue. Prince William Sound will be featured in the next issue.

Commercial fishers, outdoor recreationists and taxpayers are beginning to feel the benefits from hundreds of millions of dollars being spent within the Kodiak Island Borough as part of restoration efforts using *Exxon Valdez* civil and criminal funds.

Approximately 60 percent of the spill area habitat targeted for protection can be found on Kodiak, Afognak and Shuyak islands. Nearly 335,000 acres have already been protected, much of it added to the Kodiak National Wildlife Refuge or developed into the new Afognak Island State Park.

This not only helps protect anadromous rivers and open up private land to fishing, hunting, hiking and camping, but it has also provided a bonus for taxpayers. Last July, Refuge Manager Jay Bellinger surprised the borough with a check for $240,000 in lieu of taxes on the 109,000 acres acquired by the refuge in 1995.

Continued on Page 4



The forested mountains of Afognak Island as seen from Shuyak Island.

This custom-made tile greets visitors as they come through the door at the Alutiiq Museum.

Kodiak area restoration

Continued from Page 1

Federal law requires the payment in lieu of taxes, even though the land was not taxed under Native ownership. Bellinger says the borough will receive similar checks each year and the amount will only go up as the refuge acquires more land.

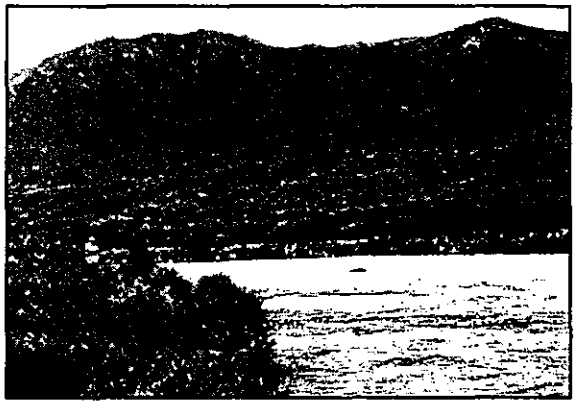
Negotiations continue for permanent protection of 57,082 acres of prime habitat along the Karluk and Sturgeon rivers. Both rivers are vital for producing salmon and are popular with hunters and sportfishers. That land is currently under a non-development easement through the year 2001. Negotiations are also underway for protection of 112,827 acres on Afognak Island, much of it slated for timber harvest.

Development of the Near Island Research Facility was made possible partly through the purchase of 26,665 acres on Shuyak Island from the Kodiak Island Borough. The borough agreed to commit $6 million from the $42 million pricetag to help fund construction.

The Trustee Council contributed $1.5 million to help fund the Alutiiq Museum, which opened in May of 1995. The museum's archaeological repository is the only artifact storage facility in the spill region. It is considered a vital resource for preserving and restoring artifacts found during Kodiak-area archaeological excavations.

In addition to the large habitat protection packages, the Trustee Council is considering another 15 sites in the Kodiak Archipelago through its small parcel program. The 1,028-acre tract at Termination Point, near Kodiak, is currently being appraised. Though this was named as the number one priority by the Kodiak Island Borough, ongoing litigation concerning the property may prevent any agreement soon. The borough has also offered more than 100 parcels of 10 acres each, which are currently being evaluated.

The acquisition of 26,625 acres on Shuyak Island could lead to expansion of Shuyak Island State Park with legislative approval.



The Karluk River is a large producer of salmon and is popular with hunters and sport fishers.

The Kodiak Waste Management Program is in its first year of planning an island-wide program to reduce chronic sources of marine pollution, such as waste oil and household cleansers. The Kodiak Island Borough will receive $267,500 this fiscal year to develop the program for island communities. A similar program in Prince William Sound is now in the implementation stage.

To boost the numbers of pink and coho salmon in Kodiak area waters, the Trustee Council funded building of a bypass in Little Waterfall Creek to open up more salmon spawning habitat in the upper reaches of the creek. This project received more than $170,000 over the last three years.

A study of Akalura and Red lakes on Kodiak Island is providing valuable information about how overescapement affects future salmon runs. Each of those lakes experienced overly large numbers of spawning salmon during the summer following the oil spill.

Several ongoing community involvement programs also affect the villages of Kodiak Island. Village residents are monitoring archaeological sites, assisting researchers with traditional knowledge of local ecosystems, and collecting biological samples of harbor seals for scientific study.

The state Division of Parks is investing $1.2 million from the Exxon criminal funds to provide trails, cabins, bridges, parking and latrines on public lands. Some of that money has been passed on to local governments for local projects.

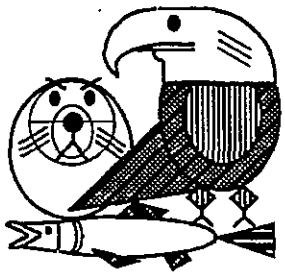
The Department of Fish and Game picked up several weir sites as part of the large parcel program and negotiations continue for acquisition of the Karluk River weir.

Kodiak Island youth are attending a "Spirit Camp" on Afognak Island thanks to a $250,000 grant using criminal funds.

Updated Meetingss List

Exxon Valdez Oil Spill Trustee Council

Restoration Office
645 G Street, Suite 401, Anchorage, Alaska 99501-3451
Phone: (907) 278-8012 Fax: (907) 276-7178



Restoration Office Tentative Meeting Schedule

September 1997
4 RWF meeting
10-11 PAG Field Trip (Kodiak)

October 1997

November 1997
3-14 Genetics & Harbor Seal reviews (3 or 4 days within this period)
4-5 PAG Workshop on Restoration Reserve (Placeholder date)

December 1997
9 Trustee Council Meeting, Anchorage - Deferred Projects (Placeholder date)

For more information on any of the above meetings, please contact the Anchorage Restoration Office.

Update: 9/3/97 rwf

ty

Habitat Protection

Exxon Valdez Oil Spill Trustee Council

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

Habitat Protection Program
Large Parcels in the Kodiak Area
Status Report

Public Advisory Group Field Trip
September 10-11, 1997

As of September 1997, the Council has spent $150.3 million to protect 335,268 acres of land in large parcels in the Kodiak area. Land more than 1,000 acres in size is considered a large parcel. Table 1 summarizes the status of large parcel land acquisitions in the Kodiak area. In addition, Lesnoi, Inc., has offered to sell 18,220 acres of land at Cape Chiniak south of Kodiak Island, but no agency has been willing to accept possible ownership of these lands.

Table 1. Status of Large Parcel Acquisitions in the Kodiak Area

September 1997

Parcel Description	Acreage	Total Price (Incl. Interest)	Trust Fund	Other Sources
Acquisitions Complete	**335,268**	**$170,549,333**	**$150,299,333**	**$20,250,000**
Seal Bay / Tonki Cape	41,549	$39,549,333	$39,549,333	$0
Akhiok - Kaguyak, Inc.	118,674	$46,000,000	$36,000,000	$10,000,000
Old Harbor[1]	31,609	$14,500,000	$11,250,000	$3,250,000
Koniag (fee title)	59,689	$26,500,000	$19,500,000	$7,000,000
Koniag (limited term easement)	57,082	$2,000,000	$2,000,000	$0
Shuyak Island	26,665	$42,000,000	$42,000,000	$0
Negotiations Continuing	**46,300**			
Afognak Joint Venture[2] Koniag (fee title)[3]	46,300	$70,000,000	$70,000,000	

[1] As part of the protection package, the Old Harbor Native Corporation agreed to protect an additional 65,000 acres of land on Sitkalidak Island as a private wildlife refuge.

[2] The Trustee Council authorized an offer of up to $70 million (including interest) for the purchase in fee of parcels AJV-3A, AJV-7, the eastern half of AJV-8 and AJV-1, with the acquisition of AJV-1 following a limited harvest planned and approved in cooperation with the state and federal governments. Acreage figures are estimates.

[3] Negotiations concern fee title to the 57,082 acres that are now under a limited conservation easement.

Acquisitions Complete

Seal Bay and Tonki Cape (Afognak Island). In November 1993, the state purchased surface title to 41,549 acres on northern Afognak Island. This mature spruce forest is adjacent to highly productive marine waters, includes anadromous fish streams, and provides excellent habitat for bald eagles and marbled murrelet nesting. The Council authorized $39.5 million (including interest) for this purchase. In 1994, the Alaska State Legislature designated these lands as the Afognak Island State Park.

Akhiok-Kaguyak. In May 1995, the federal government agreed to purchase from Akhiok-Kaguyak, Inc., surface title to 76,211 acres of land and conservation easements on 42,463 acres, for a total of 118,674 acres. These lands are within the Kodiak National Wildlife Refuge. The Council contributed $36 million to this acquisition and the federal government contributed $10 million from the federal restitution fund, for a total purchase price of $46 million.

Old Harbor. Also in 1995, the federal government purchased from the Old Harbor Native Corporation surface title to 28,609 acres of land and the corporation donated a conservation easement on 3,000 acres. These lands are within the Kodiak National Wildlife Refuge. In addition, the Old Harbor Native Corporation agreed to preserve 65,000 acres of land on nearby Sitkalidak Island as a private wildlife refuge. The Council contributed $11.25 million to this acquisition and the federal government contributed $3.25 million from the federal restitution fund, for a total purchase price of $14.5 million.

Koniag. In November 1995, the federal government purchased from Koniag, Inc., surface title to 59,689 acres of prime habitat for bear, salmon, bald eagles, and other species in the Kodiak National Wildlife Refuge. This agreement protected an additional 57,082 acres under a nondevelopment easement through the year 2001. The nondevelopment easement includes land along the Karluk and Sturgeon Rivers. The Council contributed $21.5 million to this acquisition and the federal government contributed $7 million from the federal restitution fund, for a total purchase price of $28.5 million.

Shuyak Island. In December 1995, the Council approved $42 million (including interest) to purchase from the Kodiak Island Borough surface title to 26,665 acres of prime habitat on Shuyak Island, at the northern tip of the Kodiak archipelago. The Kodiak Island Borough agreed to commit $6 million from the land sale to expansion of Kodiak's Fishery Industrial Technology Center.

As part of the purchase agreement for lands on Shuyak Island, the Council authorized up to an additional $1 million to purchase small parcels within the Kodiak

National Wildlife Refuge that have been acquired by the Kodiak Island Borough as a result of the property owners' failure to pay borough taxes. These parcels are about 10 acres in size and occupy key waterfront locations along Uyak Bay on Kodiak Island. They are embedded in two highly ranked large parcels approved as part of the Koniag purchase agreement.

Negotiations Continuing

Afognak Joint Venture. In May 1995, the Council authorized up to $70 million for an offer to purchase from Afognak Joint Venture surface title to an estimated 46,300 acres on northern Afognak Island. The property consists of seven dispersed parcels, some of which are adjacent to or near the previously acquired Seal Bay parcel, one of which is adjacent to Shuyak Strait, and one of which is in the western part of Afognak Island.

Koniag. The Council is interested in acquiring fee interest in the 57,082 acres covered by the limited term nondevelopment easement acquired in November 1995, and has agreed to maintain unobligated funds totaling $16.5 million for this purpose. The nondevelopment easement includes land along the Karluk and Sturgeon Rivers and expires on December 2, 2001.

Exxon Valdez Oil Spill Trustee Council

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

Habitat Protection Program
Small Parcels in the Kodiak Area
Status Report

Public Advisory Group Field Trip
September 10-11, 1997

As of September 1997, the Council has spent $1.2 million to protect 838 acres of land in small parcels in the Kodiak Area. Land less than 1,000 acres in size is considered a small parcel. Table 1 summarizes the status of small parcel land acquisitions in the Kodiak area. Table 2 lists parcels under consideration, but for which no offer has yet been made. Termination Point is the only parcel under consideration in the Kodiak area. Table 3 lists four additional nominations.

Table 1. Status of Small Parcel Acquisitions in the Kodiak Area

September 1997

Parcel ID	Description	Acres	Value	Status
Acquisitions Complete		**838.0**	**$1,231,200**	
KAP 98	Pestrikoff Parcel (Sitkalidak Strait)	80.0	$128,000	
KAP 99	Shugak Parcel (Kiliuda Bay)	160.0	$155,200	
KAP 101	Haakanson Parcel (Sitkalidak Strait)	80.0	$52,000	
KAP 103	Kahutak Parcel (Sitkalidak Strait)	40.0	$66,000	
KAP 105/142	Three Saints Bay	88.0	$168,000	
KAP 114	Johnson Parcel (Uyak Bay)	55.0	$154,000	
KAP 115	Johnson Parcel (Uyak Bay)	65.0	$110,500	
KAP 131	Matfay Parcel (Kiliuda Bay)	40.0	$68,000	
KAP 132	Peterson Parcel (Sitkalidak Strait)	160.0	$256,000	
KAP 135	Capjohn Parcel (Kiliuda Bay)	70.0	$73,500	
Purchase Agreement Signed		**137.0**	**$137,000**	
KAP 91	Adonga Parcel (Sitkalidak Strait)	137.0	$137,000	
Offers Under Review		**237.5**	**$1,640,300**	
KAP 220	Mouth of Ayakulik River	56.0	$213,000	Willing to sell a larger package.
KAP 226	Karluk River Lagoon	21.5	$146,000	Willing to sell a larger package.
KAP 1055	Abston Parcel (Uyak Bay)	160.0	$281,300	Discussions continue.
Kodiak Island Borough Tax Parcels			$1,000,000	Appraisals underway.
		TOTAL:	***1,212.5***	***$3,008,500***

Table 2. Parcels Under Consideration*

September 1997

Parcel ID	Description	Acres	Comments
KAP 145	Termination Point	1,028.0	Appraisal underway.

* The owners of The Triplets (KAP 22), Cusack Parcel (KAP 118) and Karluk (KAP 150) are unwilling to sell their parcels.

Table 3. Small Parcel Nominations

July 1995 to September 1997*

Parcel ID	Description	Acres	Sponsor	Rank
KAP 1050	Christiansen Parcel (Sitkalidak Strait)	159.0	USFWS	Low
KAP 1054	Christiansen Parcel (Kiliuda Bay)	160.0	USFWS	Low
KAP 1058	Leisnoi Parcel (Long Island)	1,462.0		
KAP 1065	Arneson Parcel (Alf Island/Uyak Bay)	63.0	USFWS	Low

* These parcels have been nominated since publication of *Comprehensive Habitat Protection Process: Small Parcel Evaluation & Ranking, Volume III,* Supplement July 15, 1995.

PARCEL REPORT

Parcel ID # KAP 1058 **Rank:** Moderate
Acreage: 1,462 acres **Agency Sponsor:** ADNR

Location: Long Island; Section 31, Township 27 South, Range 18 West, Sections 4,5,6 & 7. Township 28 South, Range 18 West, Sections 11,12, 13 & 14.

Landowner/Agent: Lesnoi Inc., 4300 B Street, Anchorage, AK 99503

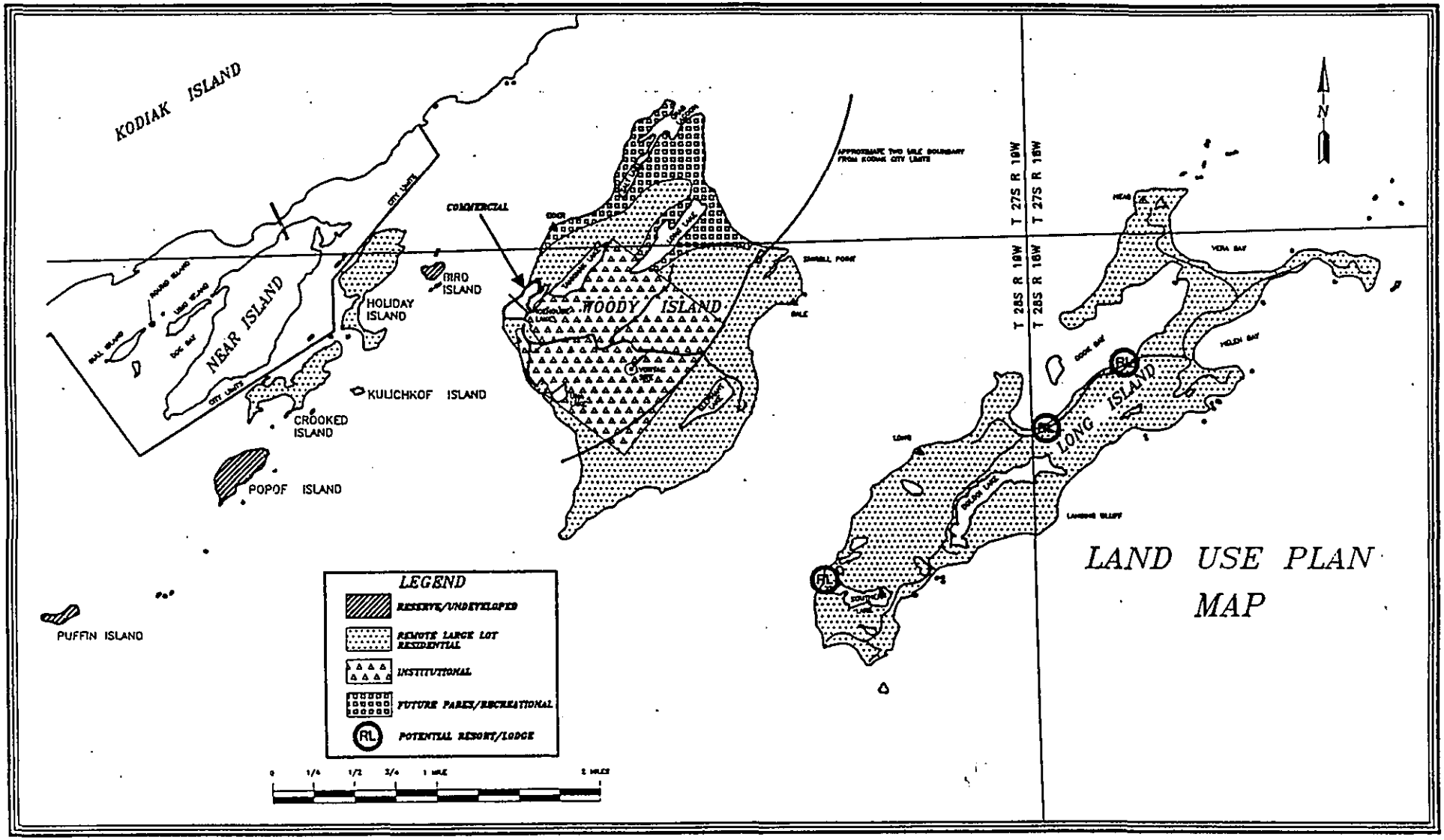
Parcel Description

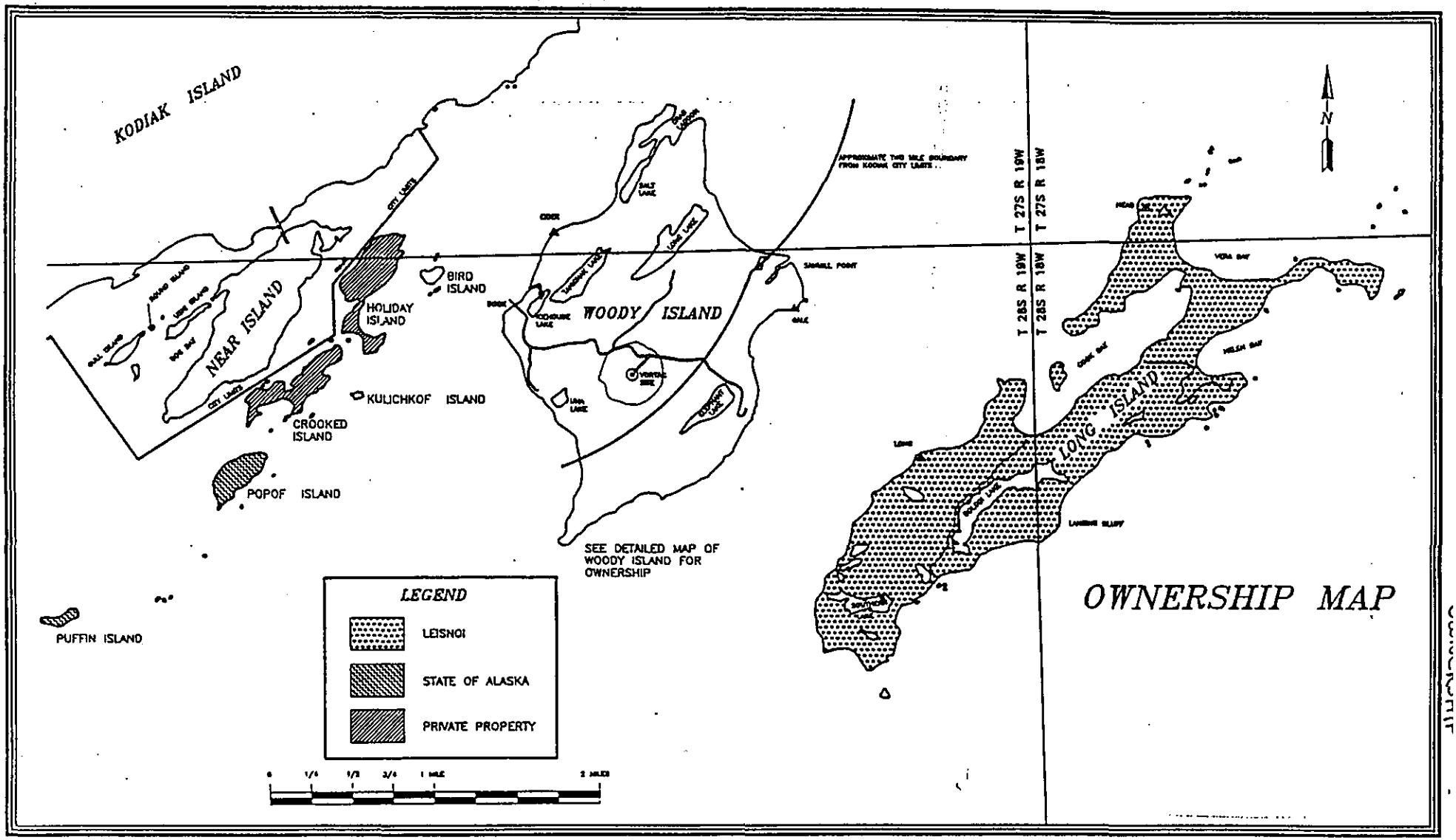
Long Island is located in the northern portion of Chiniak Bay approximately 3.5 miles east of the town of Kodiak. The entire island is being offered for sale to the Trustee Council. Cook Bay, on the northwest side of the island, provides several protected anchorages. The uplands are dominated by a Sitka spruce forest association that provides habitat for deer, small mammals and birds. The shoreline is irregular with three large embayments, Cook Bay, Helen Bay on the northeast and Vera Bay on the north. There are several sandy beaches on the west side of the island and numerous offshore rocks to the east and north. Offshore rocks are habitat for numerous seabirds and marine mammals.

There are several small freshwater lakes on the island. World War II era military installations, including bunkers, barracks and headquarters facilities, are scattered throughout the island. There are two toxic waste storage areas located south of Cook Bay. The remnants of a road system connect the military facilities to the bay.

Injured resources that utilize the island for habitat include Pacific herring, bald eagle, harbor seal and pigeon guillemot. There is a Steller sea lion (threatened species) haulout off the northeastern tip of the island and harbor seals with pups have been observed inshore. The island is used by Kodiak residents for recreation and for the subsistence harvest of ducks, rabbit, deer, octopus and shellfish. Charter boat operations based in Kodiak are currently taking ecotourists to the island to observe marine life and hike the uplands. DNR archeologists consider the island especially important because there are sites containing remnants of early Native and Russian settlements. Several of the WWII facilities are also considered to be of historic significance.

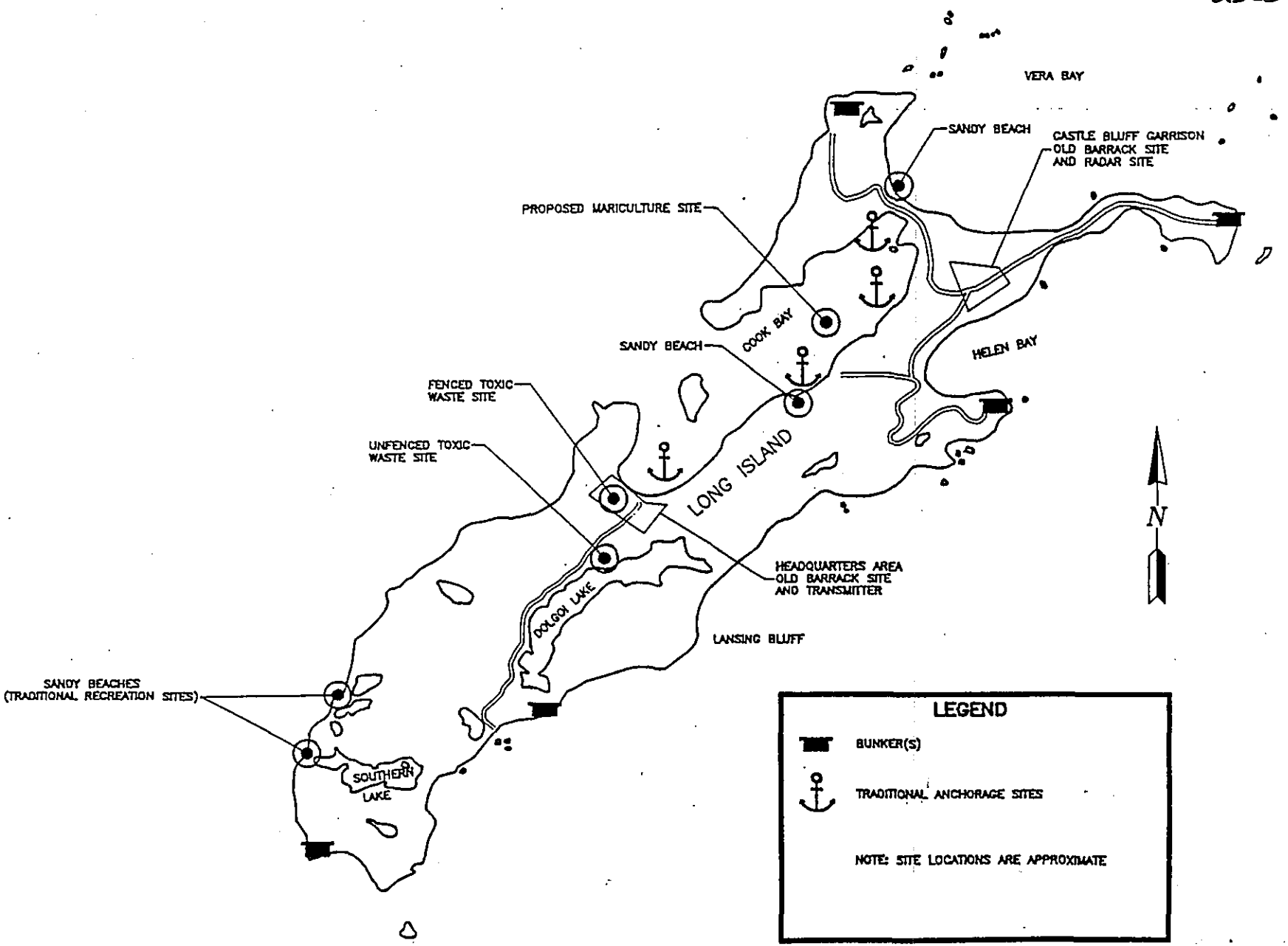
The U.S. Army Corps of Engineers has agreed to clean up the toxic waste sites and military installations. The scope of the cleanup is yet to be determined. A hazardous materials survey should precede negotiations with the owner.


KODIAK ISLAND
NEAR ISLAND
HOLIDAY ISLAND
BIRD ISLAND
KULICHKOF ISLAND
CROOKED ISLAND
POPOF ISLAND
PUFFIN ISLAND
WOODY ISLAND
LONG ISLAND
COMMERCIAL
T 27S R 16W
T 28S R 16W
LEGEND
RESERVE/UNDEVELOPED
REMOTE LARGE LOT RESIDENTIAL
INSTITUTIONAL
FUTURE PARKS/RECREATIONAL
POTENTIAL RESORT/LODGE
LAND USE PLAN MAP


KODIAK ISLAND
NEAR ISLAND
HOLIDAY ISLAND
BIRD ISLAND
KULICHKOF ISLAND
CROOKED ISLAND
POPOF ISLAND
PUFFIN ISLAND
WOODY ISLAND
LONG ISLAND
CITY LIMITS
T 27S R 19W
T 27S R 18W
T 28S R 19W
T 28S R 18W
SEE DETAILED MAP OF WOODY ISLAND FOR OWNERSHIP
LEGEND
LEISNOI
STATE OF ALASKA
PRIVATE PROPERTY
OWNERSHIP MAP

4-B

EXISTING USES



7-A

Parcel ID: KAP 145
Termination Point

Rank: Moderate **Acreage:** 1,028 **Agency Sponsor:** ADNR

Location: T27S, R20W, Sec. 6, 7, 8, & 18, Seward Meridian
Monashka Bay, Northeast coast of Kodiak Island.

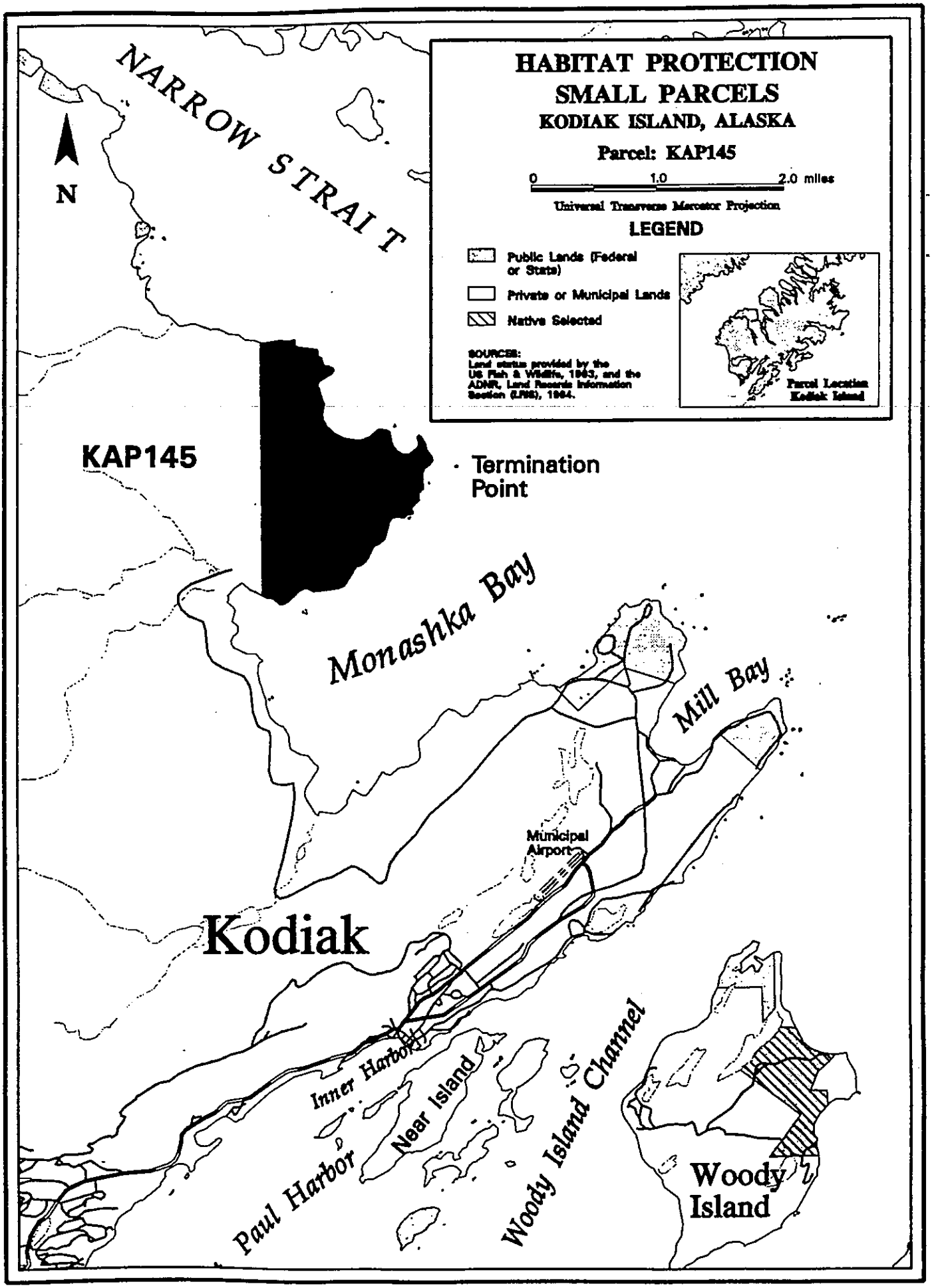
Landowner: Leisnoi Inc. (Surface estate)

Address: Box 1186
Kodiak, Alaska 99615

KAP145 is 1,028 acres in size and is located on Monashka Bay on the northeast coast of Kodiak Island approximately 12 miles from the town of Kodiak. This relatively flat coastal tract is forested with Sitka spruce and has a understory of shrubs and grasses. The parcel's four miles of convoluted shoreline is characterized by rocky cliffs and protected beaches. There are numerous nearshore rocks and extensive kelp beds present along the coastline. The productive intertidal area and the adjacent Narrow Strait are important feeding areas for marbled murrelets and pigeon guillemots as well as other marine birds. Three cultural resource sites containing middens and barabara depressions (remnant house pits) are located on the parcel. The parcel also provides subsistence resources for the village residents of Ouzinkie. Residents harvest marine mammals and fish, salmon and deer.

The parcel possesses high recreational qualities for the residents of Kodiak and is used by the public on a regular basis. The parcel is unique because it provides for a variety of year-round recreational opportunities such as hiking, fishing, hunting, ice skating, camping, and bird watching, and is accessible by the Kodiak road system.

The continued use of this parcel for recreation and the quality of recreational use are potentially at risk because of potential commercial timber harvest and/or subdivision of the parcel. Acquisition of the parcel would ensure the continued recreational use of the area by residents of Kodiak and has the support of the local populace as well as the Kodiak Island Borough. Acquisition of the parcel could also facilitate enhancement of recreational services by developing and maintaining trails, constructing parking areas and other access points.


HABITAT PROTECTION
SMALL PARCELS
KODIAK ISLAND, ALASKA
Parcel: KAP145
0
1.0
2.0 miles
Universal Transverse Mercator Projection
LEGEND
Public Lands (Federal or State)
Private or Municipal Lands
Native Selected
SOURCES:
Land status provided by the US Fish & Wildlife, 1983, and the ADNR, Land Records Information Section (LRIS), 1984.
Parcel Location Kodiak Island
N
NARROW STRAIT
KAP145
Termination Point
Monashka Bay
Mill Bay
Municipal Airport
Kodiak
Inner Harbor
Near Island
Paul Harbor
Woody Island Channel
Woody Island

Alutiiq Museum

Exxon Valdez Oil Spill Trustee Council

Restoration Update

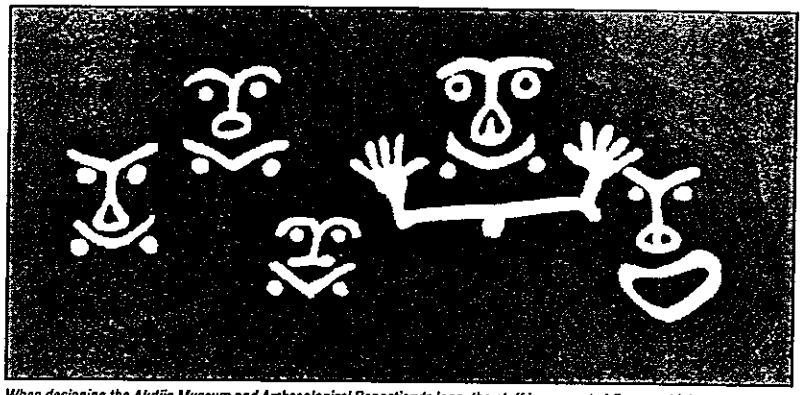
May 1995 Vol 2 No. 2

Kodiak's Alutiiq Museum Opens

The Alutiiq Museum and Archaeological Repository officially opened to the public on Saturday, May 13. Opening ceremonies marked completion of the Alutiiq Center, which houses the museum and repository on the first floor and office suites for Natives of Kodiak Inc. and Afognak Native Corporation on the second floor.

"The Trustee Council is pleased to have played a role in the creation of this facility," Craig Tillery, Assistant Alaska Attorney General said at the ceremonies. "The Trustees thank the people of Kodiak for working with us on this project. This Center will help to achieve an important restoration objective by providing the means to preserve and protect cultural resources injured by the 1989 oil spill."

Construction of the Archaeological Repository was partially funded with $1.5 million from the *Exxon Valdez* oil spill settlement funds. The regional and village Native corporations of Kodiak and the Kodiak Area Native Association jointly formed the Alutiiq Heritage Foundation to oversee operations of the center.



When designing the Alutiiq Museum and Archaeological Repository's logo, the staff incorporated figures which resemble several 1,000-year old petroglyphs found near a "Kachemak tradition" village site on Cape Alitak.

The museum will house and display artifacts, ethnographic pieces and archival collections from the Alutiiq culture in a facility with appropriate climate control and security features. The first exhibit on display at the museum is *Crossroads Alaska*, a collection of Native artifacts from Alaska and Siberia. Artifacts found during Kodiak archaeological excavations, including projects funded by the Trustee Council, will also be on display.

For more information about the Alutiiq Museum, call Amy Stephean 907/486-7004.

Exxon Valdez Oil Spill Trustee Council

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

Archaeological Index Site Monitoring (Project /007A)
Principal Investigator: Doug Reger, ADNR
Location: FY 97- two sites on Shuyak Island (AFG-081 and AFG-098)
three sites in the Alaska Maritime National Wildlife Refuge northeast of Kodiak Island (AFG-026, AFG-027, AFG-028 and AFG-143)
the Chief Cove Site at Uganik Bay near Larsen Bay (KOD-171)
FY 98- three sites on Shuyak Island (AFG-082, AFG-84 and AFG-160)
two sites at Kiavak Bay south of Old Harbor (KOD-99 and KOD-100)
the Chief Cove Site at Uganik Bay near Larsen Bay (KOD-171)

Sites monitored under Project /007A are index archaeological sites thought to be representative of archaeological sites on the public lands in the spill area that have been oiled or are being vandalized. In FY 98, the monitoring program will include sites on newly acquired habitat.

Archaeological site monitoring in 1994 and 1995 revealed no new disturbance or vandalism. However, in 1996, several sites in the Kodiak Island area suffered new damage from vandalism.

Annual monitoring began in FY 94 and is expected to continue through FY 2002 unless injuries diminish to an insignificant level. A program evaluation is scheduled during FY 98 to review past and current findings and project future monitoring needs.

Trustee Council Funding:

94007A	$246.7
95007A	$162.5
96007A	$109.9
97007A	$145.0
98007A	$139.7

Archaeological Site Stewardship (Project /149)
Principal Investigator: Doug Reger, ADNR
Location: remote areas of Uyak Bay and Uganik Bay near Larsen Bay and Sitkalidak Strait near Old Harbor

This program provides training and coordination for a cadre of volunteers to monitor vandalized sites in the oil spill area beyond the ability of agency monitoring. Resident fishermen in the areas of Uganik Bay and Uyak Bay on Shelikof Strait northwest of Kodiak Island have expressed interest in monitoring sites near their setnet locations. Those sites have suffered depredations from vandals and are among sites already identified for monitoring by the Fish and Wildlife Service. Residents on the southeast side of Kodiak Island have also inquired about monitoring endangered sites in the Sitkalidak Strait area.

The project began in FY 96 and will conclude in FY 99. Seven stewards have been recruited and trained and will monitor at least eight sites on Kodiak Island. In FY 97, the stewards conducted their first site visits. In FY 98, the stewards will compile their first reports and begin a new year of field work. The stewardship program is expected to continue after FY 98 with support from sources other than the Trustee Council.

Trustee Council Funding:

96149	$64.6
97149	$66.3
98149	$66.9

Abercrombie Park Trail

This is one of several projects in the Kodiak area financed by State restitution funds. Several hundred feet of boardwalk and a ½-mile trail have been built along the north side of Lake Gertrude in Fort Abercrombie State Park. A large staircase has been built at the end of the lake. The trail has several bridges, including at least one native log bridge. Many volunteers have worked on the project, including boy scouts and 20 volunteers. The trail will be continued around the south side of Lake Gertrude.

The project was begun in 1996 and is still underway. Its budget is $90,000.

FACILITIES

Alfred A. Owen Building

The FITC laboratories and faculty and staff offices are housed in the Alfred A. Owen building, a 20,200-square foot research facility that was dedicated in 1991. It houses a Pilot Processing Plant for the development, testing, and scale-up of seafood processing operations and includes 0, -20, and -40°C refrigerated walk-in storage units.

Fundamental and applied research takes place in modern biochemistry, chemistry, engineering, microbiology, and sensory evaluation laboratories. An instrument room, a walk-in cool room, and a media preparation room are also available. Public use areas include a research library, lecture room (capacity: 64), and conference room (capacity: 10-15).

LONG-TERM PLAN

FITC research programs are designed to maximize benefits from Alaska's renewable fisheries resources through the application of modern food science and technology. The primary objectives of FITC programs are to facilitate the profitable production of wholesome, high-quality seafood and to provide training and disseminate information to the industry.

To achieve these objectives, expansion of the current facilities is necessary. The long-term plan to obtain facilities needed by SFOS in Kodiak is to encourage the development of a multi-agency fisheries research complex, including the Owen Building. This would include a gravity-fed seawater system, wet and dry research laboratories, classrooms, offices, and a fisheries and seafood library. The complex is expected to be a cooperative effort of SFOS, the National Marine Fisheries Service, and the Alaska Department of Fish & Game.

ADMINISTRATION

Vera Alexander, Ph.D., Dean, SFOS
Albert Tyler, Ph.D., Associate Dean, SFOS
Scott Smiley (Molecular, cellular and developmental biology fishery product development)

FACULTY & RESEARCH STAFF

Jerry K. Babbitt, Ph.D., Affiliate Professor and Director, NMFS Utilizations Research Laboratory.
Kawalpveet Singh, Ph.D., Visiting Faculty. Seafood Engineering.
Chris G. Bublitz, M.S., Research Scientist. Fish physiology, harvesting science and technology.
Gour S. Choudhury, Ph.D., Associate Professor. Seafood engineering, by-product utilization, extrusion, microbial technology, process automation, unit operations, modeling.
Charles A. Crapo, Ph.D., Associate Professor and Salmon Quality Specialist. Seafood quality, quality, assurance, seafood processing and preservation.
Cat Klinkert, B.S., Laboratory Technician. Harvesting Science.
John S. French, Ph.D., Professor (UAF). Biochemistry of proteins and lipids, postmortem changes in seafood quality, effects of environmental stress on seafood quality.
Brian H. Himelbloom, Ph.D., Associate Professor. Microbiology of fish and fish products, microbial physiology, applied enzymology.
John M. Kennish, Ph.D., Affiliate Professor (UAA). Analytical chemistry, seafood quality changes, fish lipids.
Henry Pennington, M.S. (retired), Assistant Professor, Marine Advisory Program. Fisheries development, marine safety, coastal resource management.
Robert Pfutzenreuter, B.S., Laboratory Technician. Microbiology.
Updated by B.H.H. 8/29/97

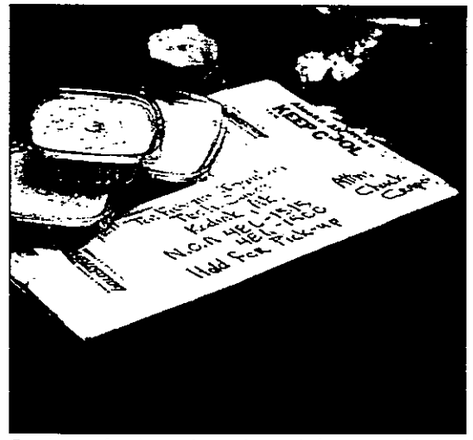
ADMINISTRATIVE & SUPPORT STAFF

Kay Bodi, Custodian/Maintenance
Patrick Dooley, HVAC Technician
Lavonda A. Valley, Accounts Clerk
Margaret A. Zabinko, Administrative Assistant

Fishery Industrial Technology Center
University of Alaska Fairbanks
900 Trident Way
Kodiak, Alaska 99615
Phone: (907) 486-1500
FAX: (907 486-1540

SELECTED RESEARCH ACTIVITIES

- Improving chilled and refrigerated seawater systems on fishing vessels
- Evaluating *sous-vide* processing for pink salmon
- Developing extrusion processing of salmon muscle proteins
- Evaluating opportunities for flaked products from pink salmon
- Surveying the microbiological quality of Alaskan seafood
- Providing technical support and technological development for surimi manufacturing
- Analyzing flatfish reactions to rig trawls to minimize halibut by-catch through the use of modified trawl gear
- Evaluating pollock trawl fishery selectivity of square mesh codends
- Identifying new methods for detecting and removing parasites in white fish
- Evaluating handling, quality, and stability of whole and minced flatfish
- Characterizing seafood processing by-products for conversion to energy and other products



Fresh seafood product shipped from an Alaskan processor to FITC for chemical and microbial evaluation. (Photo: H. Pennington)

COVER PHOTO: A driftnet fisherman picks a red salmon from his net. Research and development at FITC begin with the harvest of fishery resources. (Photo: D. Mercy)

FISHERY INDUSTRIAL TECHNOLOGY CENTER

KODIAK, ALASKA

SCHOOL OF FISHERIES & OCEAN SCIENCES

UNIVERSITY OF ALASKA FAIRBANKS

FISHERY INDUSTRIAL TECHNOLOGY CENTER

The Fishery Industrial Technology Center (FITC) has grown steadily since its creation in 1981 by an act of the Alaska Legislature. A unit of the University of Alaska Fairbanks (UAF) School of Fisheries and Ocean Sciences (SFOS), FITC conducts a research and development program and provides technology transfer and training to enhance the economic development of the Alaskan fishing industry. Activities are supported by the industry and by state and federal grants.

Fishery Industrial Technology Center as seen from across Trident Basin in Kodiak. (Photo: B. Himelbloom)

PROGRAMS AND OBJECTIVES

Fish Harvesting Science and Technology

FITC personnel conduct research to develop and improve fishing gear and on-board handling technologies to maximize the quality of the harvest. Current research includes:

- fundamental studies on the physiology of harvested species, including
  - perception of fishing baits, gear, and vessels
  - behavior upon encountering and escaping fishing gear
  - factors controlling swimming rates and endurance
- applied studies on the behavior of fishing gear during deployment and use

Fisherman aboard a seine skiff pulls the net off the back of the fishing boat to make a set. (Photo: D. Mercy)

- development of fishing gear technology to optimize the efficiency and selectivity of gear to
  - separate targeted and unwanted species
  - separate targeted and undersized fish

Seafood Science and Processing Technology

Researchers study the fundamental properties of seafood to enhance its use in safe, nutritious seafood products. They apply concepts of biochemistry, chemistry, microbiology, and seafood engineering to maximize the use of fish, shellfish, and by-product materials. Projects are underway to develop:

- technologies to ensure high product quality from harvest to the consumer
- methods to determine and preserve the nutritional value of Alaskan seafood
- optimum processing protocols through engineering analysis of energy, material, and labor use in seafood-processing operations
- methods to extend the shelf life of fresh and frozen seafoods, including the application of modern packaging and preservation techniques
- new product concepts and to assist the industry in developing and marketing those products

Fisheries and Food Science Training

Training Alaskans in the management and use of their marine resources is part of the University of Alaska land and sea grant mission. FITC faculty contribute to this effort by

- teaching courses for fisheries or management undergraduate students and for other science majors interested in food science
- developing and supervising a student internship program to provide hands-on experience in the industry
- coordinating the University of Alaska portion of the cooperative Bachelor of Science in Food Science and Technology program with Oregon State University
- developing the Food Science and Nutrition program shared by SFOS and the School of Agriculture and Land Resources Management
- providing graduate training opportunities in fish harvesting and food science and nutrition at the M.S. and Ph.D. levels

FITC personnel work with Alaskan seafood processors to prevent and solve problems. Here Bob Pfutzenreuter prepares microbe samples taken on a seafood line to evaluate cleanup and sanitation procedures. (Photo: H. Pennington)

Technology Transfer

A primary objective of FITC scientists and educators is to ensure that research results are made known to the people who can use the information. FITC personnel work with the fishing industry and state and federal agencies to identify areas of interest or concern and to develop seminars and workshops on those topics. Other technology transfer activities include:

- providing short courses of specific interest to students and fishing industry personnel
- advising the fishing industry on use of new and existing technologies
- developing cost analyses for the use of new and existing technologies by the fishing industry

A major goal of the Alaskan fishing industry is to expand beyond traditional canned or whole-frozen markets for pink salmon. Chuck Crapo (white shirt) and Brian Himelbloom prepare pink salmon using European sous-vide processing methods. (Photo: H. Pennington)

Public Service

Outreach and public service activities are also important responsibilities of the FITC. The Center location and personnel expertise provide a focus for fishing-related public activities in Kodiak. FITC personnel

- serve on various local, state, national, and international professional boards and committees, editorial boards, and advisory groups
- present current information in seminars, workshops, and short courses for the industry
- provide information for K-12 students and teachers on fish harvesting and seafood processing research

Fisheries Industrial Technology Center

TC Sponsored Restoration Efforts, Kodiak Island Area

Exxon Valdez Oil Spill Trustee Council

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

TRUSTEE-COUNCIL SPONSORED RESTORATION EFFORTS KODIAK ISLAND AREA

FISH

Little Waterfall Barrier Bypass Improvement (Project /139A1)
Principal Investigator: Steve Honnold, ADFG
Location: Afognak Island, Kodiak

In FY 96, Trustee Council funds paid for renovation of the bypass on Little Waterfall Creek (decreased grades and additional resting pools). The renovation was designed to increase available spawning habitat for pinks and cohos, thus providing additional salmon for harvest as a replacement for salmon lost due to the oil spill. Evaluation of the bypass improvements, including documentation of salmon passage, spawner enumeration, and juvenile salmon abundance, is underway in FY 97. A final report on the project will be prepared in FY 98.

The Council selected Little Waterfall Creek as a site for spawning habitat improvement based on surveys conducted to evaluate restoration opportunities for wild salmon stocks on Kodiak Island. A cost-benefit analysis was also performed. ADFG estimates an additional 24,000 pink salmon and 3,000 coho salmon could be available for harvest as a result of production from the enhanced habitat use. Little Waterfall Bay (Little Waterfall Creek drainage) was directly impacted by the oil spill.

Trustee Council Funding:

94139	$222.1	(survey/evaluation of numerous streams)
95139A1	$ 96.7	(engineering/design)
96139A1	$ 40.6	(construction)
97139A1	$ 26.4	(monitoring/evaluation)
98139A1-CLO	$ 13.4	(final data analysis and report writing)

Sockeye Salmon Overescapement (Projects /258 & 97251)
Principal Investigator: Dana Schmidt, Steve Honnold, and Charles Swanton, ADFG
Location: Red and Akalura lakes, southern Kodiak Island (and Kenai/Skilak system)

Due to commercial fishing closures following the oil spill, higher-than-desirable numbers (i.e., overescapement) of spawning salmon entered a number of systems, including Red and Akalura lakes on southern Kodiak Island. Although the exact reason is

unclear, lost sockeye production resulted as shown by declines in the returns of adults per spawning sockeye.

Through Project /258, the Trustee Council has monitored the effects of sockeye overescapement in Red and Akalura lakes (as well as in the Kenai River system). Production of zooplankton in both lakes has now rebounded. Although the return per spawning adult continues to be lower than normal, productivity is now at acceptable levels. The project is being closed out (final data analysis and report writing) in FY 97.

Trustee Council Funding (Kenai and Kodiak efforts combined):

94258	$762.3	(field studies)
95258	$724.5	(field studies)
96258	$540.5	(final year of field studies)
97258-CLO,97251	$257.7	(one additional year of smolt emigration studies at Akalura Lake; report writing)

Historical Analysis of Sockeye Salmon Growth (Project 96048)
Principal Investigator: Gregory Ruggerone, Natural Resources Consultants, Inc.
Location: Akalura and Red lakes (and Kenai River system, Coghill Lake, Chignik Lake)

This Trustee-Council funded effort is using adult sockeye scales to reconstruct the growth of sockeye salmon before, during, and after the oil spill. Scales are available through ADFG's normal management activities back to 1920 for some stocks, and back to 1970 for Red Lake and 1985 for Akalura Lake. A final report is due September 30, 1997.

Trustee Council Funding (all locations combined):

96048	$109.5 (scale analysis and final report writing)

Rockfish and Pollock Genetics (Project 98252)
Principal Investigator: Jim Seeb, ADFG
Location: Waters off Kodiak Island (and other spill-affected areas)

This project, which is scheduled to begin in FY 98, will obtain genetic stock structure information on black rockfish and walleye pollock, both of which have faced increased harvest pressure as replacement species following the oil spill. Understanding the genetic structure of discrete stocks will improve management capabilities for these species. The genetic analysis will be performed at the Alaska SeaLife Center.

Trustee Council Funding (all locations combined):

98252	$209.1 (field work)
Additional years likely	

HARBOR SEALS

Community Harbor Seal Biosampling and Management (Project /244)
Principal Investigator: Monica Riedel (Alaska Native Harbor Seal Commission) and Jim Fall (ADFG)
Location: Akhiok and Old Harbor on Kodiak Island (and seven communities in Prince William Sound and Lower Cook Inlet)

Since FY 94 the Trustee Council has supported a collaboration between subsistence hunters of harbor seals, scientists, and resource managers to assess the factors affecting the recovery of the harbor seal population and to identify ways to reduce these impacts. Early efforts included workshops and community meetings, which led to formation of the Alaska Native Harbor Seal Commission. The effort in FY 96-98 is focusing on a three-year pilot project to train village-based technicians to collect biosamples from harbor seals. The samples are then used by ongoing EVOS projects seeking to explain why harbor seals are not recovering. A formal review of this pilot project's results will be conducted during a harbor seal session to be conducted by the Chief Scientist this fall (tentatively scheduled for the second week of November).

Trustee Council Funding:

94244	$ 44.9 (community meetings/workshops)
95244	$ 76.1 (community meetings/workshops)
96244	$125.0 (primarily biosampling)
97244	$114.9 (primarily biosampling)
98244-CLO	$ 84.7 (continued biosampling and final report)

HARLEQUIN DUCKS

Differentiation and Interchange of Harlequin Ducks (Project /161)
Principal Investigator: Buddy Goatcher, DOI
Location: Kodiak National Wildlife Refuge (and Prince William Sound and Katmai National Park)

This project is using genetic analyses and color-marking to assess harlequin ducks' spatial population structuring and movements among geographic regions. The project is intended to improve understanding of the extent of past and ongoing injury, interpret measures of recovery, and determine limitations to recovery and restoration strategies. Field work on this project is concluding in FY 97 and a final report will be prepared in FY 98.

Harlequin ducks suffered direct oiling mortality during the oil spill, and were particularly vulnerable to subsequent oil effects due to their reliance on nearshore habitats and associated invertebrate prey.

Trustee Council Funding:

96161	$81.1	(field studies)
97161	$98.8	(field studies)
98161-CLO	$16.5	(final data analysis and report writing)

RESIDUAL OIL

Shoreline Oiling Assessment (Project /027)
Principal Investigator: Ron Bruyere and Dianne Munson, ADEC
Location: Oiled sites in the Kodiak archipelago

Working with community members, in the summer of 1995 ADEC identified and visited 30 sites in the Kodiak archipelago that had measurable or reported oiling in 1990/91 to determine the persistence of that oil. Most sites were located on Shuyak and northwest Afognak islands, between Sturgeon Head and Chief Cove on the Shelikof Straight coast of Kodiak Island, or near the village of Larson Bay. Surveys found no oil at sites south of Chief Cove, trace amounts at Chief Cove, and widely spaced trace amounts at the Shuyak Island sites. Traces consisted primarily of tar splatter with a few small areas of friable, weathered oil residue. No subsurface oil was found.

The surveyors concluded that oiling in the Kodiak archipelago was not persisting as it was at sites in Prince William Sound due to the higher energy settings on the islands, the state of the oil when it came ashore, and the smaller concentrations of initial oiling relative to Prince William Sound.

Trustee Council Funding:

95027	$180.5	(shoreline survey)
96027	$ 42.9	(final data analysis and report writing)

Exxon Valdez Oil Spill Trustee Council

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

Kodiak Island Borough Master Waste Management Plan (Project /304)
Principal Investigator: Jerome Selby, Mayor, Kodiak Island Borough
Project Manager: Ron Riemer, Kodiak Island Borough
Location: All seven villages on Kodiak Island (Akhiok, Larsen Bay, Old Harbor, Ouzinkie, Port Lions, Karluk and Chiniak) and the City of Kodiak

For FY 97, the Trustee Council approved a one-year project to develop a waste management plan for Kodiak Island Borough in order to remove chronic sources of marine pollution and solid waste that may be affecting recovery of resources and services injured by the spill. The waste streams that will be addressed in the regional plan are used oil generated by vessels and communities, household hazardous waste, solid waste and sewage.

Development of the plan is being overseen by a committee that consists of representatives from each of the seven villages on Kodiak Island, the City of Kodiak (harbor master), Kodiak Island Borough, Kodiak Area Native Association, the U.S. Coast Guard and the Alaska Department of Environmental Conservation. The borough has hired the firm of Montgomery Watson to help it prepare the plan. The consultant has drafted two reports: *Inventory of Pollution Sources and Problems* and *Alternatives Analysis on Potential Funding Sources*. The committee is reviewing and modifying the alternatives presented in the draft report.

One alternative under consideration is use of "Smart Ash" incinerators to burn used oil. A heat recovery unit can be attached to the incinerator. The borough has asked for permission to reallocate about $3,000 from the existing contract to buy a "Smart Ash" incinerator to use as a pilot unit in one of the villages.

Public meetings on the draft plan will be held in October. The plan is expected to be completed by December 1997.

Neither the borough nor the Restoration Office is certain that the borough will ask the Trustee Council for future funding to implement the plan. The *FY 98 Invitation to Submit Restoration Proposals* says, "(A) proposal for implementation of the plan may be considered after review of the final report."

Trustee Council Funding:

97304	$267.5	(planning)

Other Materials

Dan Logan and his pal Rocky.

Who is the Octopus Project?

David Scheel, Principle Investigator
Tania Vincent, Biologist, Artist
Becca Dodge, Project Biologist
Kathy Hough, Biologist
Scott Wilbur, Biologist
Kathleen Pollet, Volunteer

Divers
Dan Logan, U.S. Forest Service
Neal Oppen, R/V *Tempest*
Roger Trani, Cordova High School
Tom Kline, PWS Science Center
Beth Haley, PWS Science Center
Michael Kyte, Pentec Environmental

Traditional Knowledge
Mike Eleshansky (Chenega Bay)
Simeon Kvashnikoff (Port Graham)
Jerry Totemoff (Tatitlek)

and a special thanks to:
Renee Ernster, crew of R/V *Tempest*

This project was supported by the Exxon Valdez Oil Spill Trustee Council and Project Aware.

PRINCE WILLIAM SOUND SCIENCE CENTER
CORDOVA ALASKA

A complete report has been provided to the EVOS Restoration Office and will be available from the Oil Spill Public Information Center after review.

Amikuq[1]

The Giant Octopus in Prince William Sound & Cook Inlet

[1]*The Alutiiq word for octopus.*

This report provides the results of the 1995-96 Octopus Project. For more information, visit our web site.
http:\\www.pwssc.gen.ak.us\~dls\octopus\

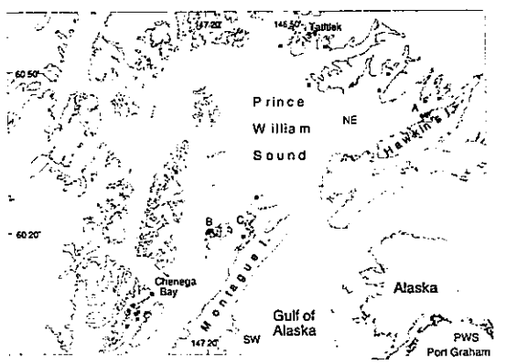
Field notes

As with most things in life, when we started this project, we did not know exactly what it would involve. Field work, for sure, and a bit of time to analyze the data and write the results. Since then, however, some of us visited Old Chenega for the first time, talked with Marie Smith (the last native speaker of the Eyak language), spent a week in the Chenega Bay school house when the winds were blowing too high to fly an airplane, met sea lions and wolf eels while diving, looked at a lot of beaches, got seasick (almost!) aboard the *Tempest*, ate octopus from Fedora's kitchen, and even spent the night in Mike Eleshansky's pantry!

Some of the sites that we studied are shown in the map below. We also did some work in Port Graham. This report tells you what we found. We have tried to write it without technical language (but we are scientists, so it's hard to leave out all the Latin names and other fun tools of our trade).

Octopuses' eyes observe you as often as you observe them.

What was this study about? In response to interest from native villages in the *Exxon Valdez* oil spill impacted area, we studied Giant Octopuses (*Octopus dofleini*). Octopuses are a part of the subsistence lifestyle in the villages, and people had noticed that the octopuses were harder to find in years following the oil spill. To address this concern, we decided to find out some basic things about the octopuses here: Where are they found? How many? Are they reproducing in the area? What do they eat? What eats them? We completed two years of work, studying areas in the intertidal and in shallow subtidal habitats that were accessible during low tides or by SCUBA diving. Due to the limitations of SCUBA, we could not work deeper than about 20-30 meters (100 feet).



Sites in Prince William Sound. Black boxes were diving sites; white circles were intertidal. A, B, and C mark where we tracked octopuses using sonic telemetry.

The octopus life cycle

Octopuses begin their lives as eggs, tended by their mother. She lays her eggs inside a rocky den and may lay from 20,000 - 100,000 eggs over a period of several days. The female will tend the eggs, cleaning them and blowing water across them until they hatch, which may take from 150 days to seven or more months, depending on the water temperature. Upon hatching, newly emerged larvae immediately swim toward the surface and live as plankton for 28 to 90 days.

As plankton, they feed on other plankton near the surface. If they survive, they settle to the bottom when they reach a weight of about 5 grams. Octopuses grow quickly, and may reach 0.5 - 1 kg by one year, and 15 kg after 3 years. They eat mostly crabs and clams, and the juveniles can be found at depths from the intertidal to 200 m or deeper. However, many juveniles live in water less than 30 m deep.

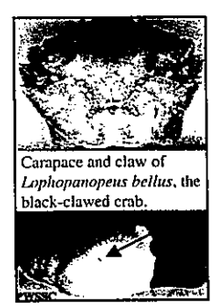
Males mature earlier (smaller) than females. The tip of the third right arm is modified in mature males, forming a spoon-like organ (called the hectocotylus) that is used for mating. In mature males, this organ may be up to one fifth the length of the arm. Mating may occur at depths from 20 - 100 m, and takes several hours. Males may mate with more than one female and females appear to prefer larger males as mates. Eggs are laid some time after mating. The females brood the eggs, at which time they stop feeding. Females die shortly after the eggs hatch. Males may live a few months after mating. Maximum life span in the absence of reproduction is believed to be five years.

This species (*Octopus dofleini*) ranges from southern California up to British Columbia, along the southern Alaska coast and the Aleutian Islands, and down to Japan.

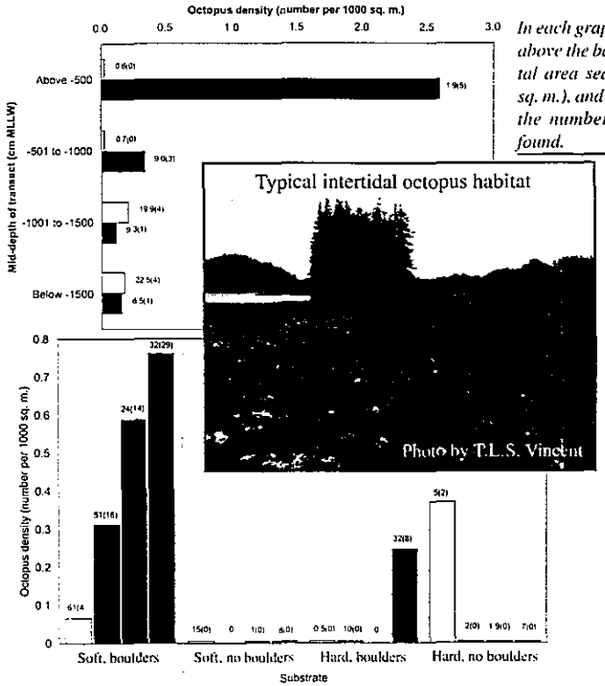
What did octopuses eat?

Octopuses bring a lot of food back to their dens to eat; and when they are done, they toss the garbage out the door into a midden pile. All of the items shown in this section were collected from these piles.

Like many of us, octopuses like to eat crabs. People usually feast on large crabs like Dungeness (*Cancer magister*) or Tanner crabs (*Chionoecetes bairdi*). But you wouldn't find these crabs at the dinner table of an intertidal octopus in Prince William Sound. Most of their favorite crabs never get bigger than 5 cm and are usually smaller than the spelling of their name: *Cancer oregonensis* or *Lophopanopeus bellus*. The biggest crab these octo-



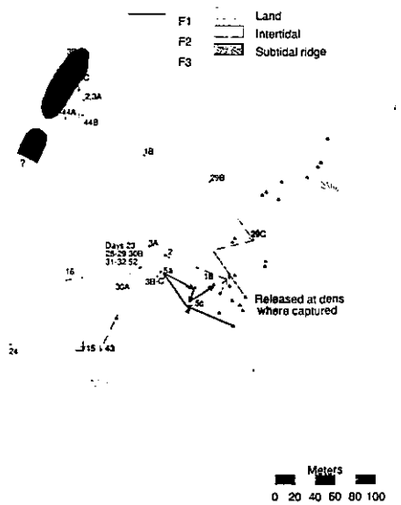
Carapace and claw of *Lophopanopeus bellus*, the black-clawed crab.



In each graph, the numbers above the bars show the total area searched (x 1000 sq. m.), and in parentheses, the number of octopuses found.

Where did we find octopuses?

Most of the octopuses that we found (79%) were in the intertidal zone between +2 and -1.5 m deep. As you can see in the top graph at left, octopuses were also more abundant on our shallow dives than they were on deep dives. In the bottom graph, we show the types of habitats where we found octopuses in the intertidal. Octopuses were predominantly found on soft substrates (mud, sand or gravel) rather than hard (bedrock, rock outcrops, large cobble fields); and where boulders were present rather than where they were absent. This makes sense, as the octopuses love to excavate their dens under the boulders. We also discovered (still in the bottom graph) that octopuses were associated with areas of dense kelp (open bars are the least kelp, solid bars the most kelp). We *did not* find more octopuses near eel grass beds.



We put sonic tags on five octopuses. The sonic tag emits a 'ping' and allows us to track the octopus with a directional hydrophone. After being tagged, the octopuses went to deeper water. However, they came back to the intertidal pretty quickly. The map at right shows the movements of three of these octopuses. Note that they spend most of their time in very shallow water.

These three things, the numbers of octopuses in the intertidal, the higher numbers on shallow dives compared to deep dives, and the return of disturbed individuals to the intertidal, all suggest that octopuses in Prince William Sound prefer intertidal habitats and use them regularly.

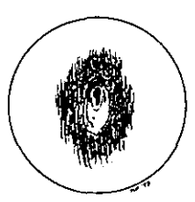
Food, cont...

puses munch on is the helmet crab (*Telmessus cheiragonus*), which can grow to be a respectable 10 cm (4 in.) wide. Subtidal octopuses don't eat as many crabs as intertidal octopuses. They consume lots of scallops, which are plentiful near their subtidal homes (below 4.5 m or 14 ft deep).

The Oregon Cancer crab, *Cancer oregonensis*. See the drill hole?

Octopuses are notoriously hungry creatures, requiring enough food to grow up to 1.8% of their body weight per day. We found that octopuses eat up to 8 crabs per day and can grow as much as 3.58 kg (7.89 lbs) in 130 days. Despite their appetite, octopuses can be picky about their food. Do spinach, brussel sprouts or liver catch in your craw? This is apparently how octopuses feel about a certain crab (*Acantholithodes hispidus*), which we found on our surveys, but rarely in the midden piles of octopuses.

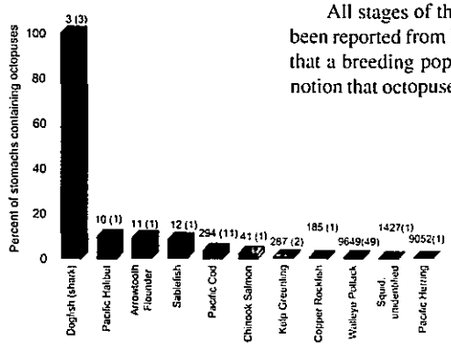
How does an octopus get through the hard outer shell of clams and crabs? Octopus saliva softens the shell of their prey and the octopus scrapes away the partially dissolved shell with a special organ called the radula. In this way, the octopus drills through the shell of its prey. Once a pin-hole opening has been made, more saliva kills the prey and the octopus can pry it open. For some prey, such as small scallops, the octopus simply pries it open with its arms. For other prey, such as soft shelled crabs, the octopus bites through the shell using its beak. All these marks can be found on the remains of meals that octopuses discard outside their dens.



On the preceding page is a drawing of a drill mark (scale bar is one millimeter), and at right is a bite mark left by an octopus on a leg of the helmet crab (scale bar one centimeter).

What eats octopuses?

Just about anything that can find them. For example, octopus parts were found in the stomachs of 26% of 43 fish species examined in a 1995 study in the Sound (see graph right. Above each column is how many stomachs were examined and the number of octopuses found in parentheses). Harbor seals in the Sound also eat octopuses, as do sea otters.



We found more octopuses in shallow water and near heavy kelp cover. Sonic-tagged octopuses that left the intertidal after we disturbed them returned to intertidal areas with heavy kelp. This suggests that dense broad-leaf kelps were an important feature of octopus habitat. Why did octopuses like kelp?

We found no evidence that there was more food in shallow water nor in the kelp. However, kelp may provide cover to octopuses, keeping them out of view of their predators. Living in the intertidal might be a way to avoid predators because predators like the big fishes do not spend time in very shallow areas. Even sea otters, although they can feed in the intertidal, feed about 95% of the time in water from 8 to 34 meters deep.

Octopus densities in our study were only one tenth as high as densities in British Columbia (where the only data for comparison were from). Most predators that we have here are also down there, yet in British Columbia the octopuses are not found near kelp beds or in particularly shallow water. However, while sea otters were exterminated in both areas, the two sites differ in that otters have returned to Prince William Sound, but were still absent from British Columbia. We think that intertidal habitats in the Sound provide refuge from sea otter predation, and octopuses here may be limited in distribution to depths where otters do not forage.

CONCLUSIONS

Several results from this project might be considered by fishermen who harvest octopuses. First, about 80% of the octopuses that we found occurred in shallow water habitats from the intertidal to -5 m; only 20% were found in deeper water to -30 m. Second, octopuses in the shallow habitats stayed there: they may only move a few hundred meters over the course of a year. So, intertidal and very shallow habitats may provide the necessary rearing habitat for octopuses that settle there. Harvesting in the intertidal may draw from a confined strip of habitat extending only as deep as -5 m. However, octopuses made short trips from the intertidal to the very shallow subtidal in our study, so that octopuses harvested from intertidal dens may be quickly replaced by octopuses from adjacent subtidal habitat. It is unlikely, however, that this pool of octopuses extends to depths from -5 to -30 m.

All stages of the octopus life cycle, except for eggs, have been reported from Prince William Sound, so we think it likely that a breeding population exists there. Given the prevailing notion that octopuses have become scarce recently, we suggest that fishermen refrain from harvesting individuals 15 kgs and larger, as these animals may be close to breeding size.

Sea otters compete with octopus for both bivalves and crabs and sea otters also prey on octopuses. Therefore, sea otters may be limiting both the distribution and abundance of octopuses in Prince William Sound and Port Graham. If so, this would suggest that octopuses living below otter foraging depths (rarely deeper than -30 m) may be more plentiful than at depths from -5 to -30 m where most otters forage.

Where are all the octopuses?

Finally, the low octopus densities recorded in this study deserve consideration. Native villagers in the Sound and Cook Inlet have noted a decline in *Octopus dofleini* abundance, and voiced concern about the status of octopus following the *Exxon Valdez* oil spill. Elsewhere along the east Pacific coast, several aquariums, where the Giant Octopus is a popular exhibit, complained about being unable to get octopuses. Declines during the early 1990s in the Japanese fishery have raised concerns about *O. dofleini* in that country also. Taken alone, none of these data are more than suggestive. For example, densities from Alaska and British Columbia are unlikely to be directly comparable. Cumulatively however, these observations raise the question of whether *O. dofleini* has been declining throughout its range during the 1990s. This question could not be answered by this study, as no long term data were available for comparison.

Amikuq

CRAB, SHRIMP AND THE *EXXON VALDEZ* OIL SPILL

WERE CRAB AND SHRIMP POPULATIONS INJURED BY THE *EXXON VALDEZ* SPILL?

There is no evidence showing a direct link between the spill and the decline of crab and shrimp populations. The Trustee Council conducted five studies -- four in Prince William Sound and one in the Kodiak region -- to assess whether spilled oil could have played a significant role in the decline. None of the studies produced clear evidence of significant injury to crab and shrimp. This does not mean no injury occurred, but if there was injury, it was not documented.

WHY DID CRAB AND SHRIMP POPULATIONS DECLINE?

No one knows for sure, but the Trustee Council's APEX project has uncovered data indicating that in the late 1970s there was a major change in the northern Gulf of Alaska ecosystem. A natural increase in the water temperature may have played a major role. Crab and shrimp dominated before this change occurred, but were quickly replaced by bottom fish, such as pollock and cod.

CAN ANYTHING BE DONE TO IMPROVE SHRIMP AND CRAB NUMBERS?

There is no "on the shelf" technique for restoring or enhancing crab and shrimp populations, particularly if the cause of their decline was a change in water temperature. Very little is known about the biology, life history and population dynamics of crab and shrimp, especially in the Gulf of Alaska. The opportunity for worthwhile research on crab and shrimp is unlimited and, over the long term, research on crab and shrimp would pay off in terms of better management and healthier populations. However, there is no easy way to go out and create more crab and shrimp.

CAN THE TRUSTEE COUNCIL FUND THIS TYPE OF RESEARCH?

The Trustee Council is limited to restoration of the resources injured by the spill. Since no injury to crab and shrimp has been documented and there is no simple way to increase their populations, spending millions of dollars on crab and shrimp research is not a priority for restoration funds. However, much of what we are learning through other ecosystem-based studies can help provide a better understanding of crab and shrimp in northern gulf waters.

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MEMORANDUM

TO: Trustee Council

FROM: Molly McCammon
Executive Director

DATE: November 22, 1996

RE: Crab and shrimp update

Those of you present at the Trustee Council's public hearing in Kodiak last spring will recall that several members of the public expressed interest in restoration of crab and shrimp in the spill area. This interest was also expressed in the six Kodiak villages I visited last spring, as well by several residents of lower Cook Inlet communities.

As a result, I asked Stan Senner and Bob Spies to compile whatever information existed on oil-spill impacts and the current status of restoration, research and management activities. The attached memorandum is that end product.

I have asked Stan to work with Communications Coordinator Joe Hunt to put this information into an easily understood, 1 or 2 page brochure for the general public. We plan to discuss this at the annual workshop in January with the community facilitators.

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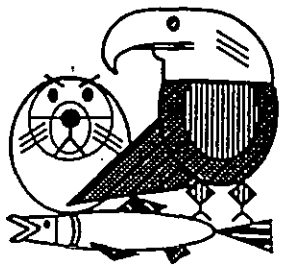

MEMORANDUM

To: Molly McCammon, Executive Director

From: Stan Senner, Science Coordinator

Subject: Crab, Shrimp, and the *Exxon Valdez* Oil Spill

Date: October 29, 1996

This memorandum is in response to your request for information on the status of crab and shrimp populations in the oil-spill area. Specifically, you asked for information on oil-spill impacts, the kinds of restoration, research, and management activities now underway, and possibilities for future restoration and enhancement activities. You also asked for a recommendation on the possibility of small workshop or other means of addressing concerns about the status of crab and shrimp.

Much of the information presented below on the stock status and current and future restoration and management actions was provided by Gordon Kruse, Alaska Department of Fish and Game, Juneau. Doug Pengilly and William Donaldson, ADFG, Kodiak, and A.J. Paul, University of Alaska Institute of Marine Science, Seward, also were helpful. Any errors in fact or interpretation are my own, as are the recommendations at the end.

EVOS Impacts

There were several Natural Resources Damage Assessment studies that bear on injury to crab and shrimp. The results did not provide any clear evidence of significant or lasting injury to these shellfish due to the oil spill.

Subtidal Study No. 5 (Trowbridge 1995) addressed "Injury to Prince William Sound Spot Shrimp" (*Pandalus platyceros*). Evidence of injury included a lower catch per unit effort (CPUE) in oiled southwestern PWS compared to unoiled northern PWS in 1989 and 1990, fewer eggs per female in the oiled area in 1989, and a higher proportion of inflammatory gill lesions on shrimp in the oiled area. Although the investigator concluded that probably there was injury to spot shrimp due to the oil spill, it was very difficult to assess due to geographic differences in commercial fishing histories (primarily, heavy prespill pressure in southwest PWS). This study was concluded in 1991.

Fish/Shellfish Study No. 14 (O'Clair 1990.) addressed "Injury to Prince William Sound Crabs." This study was intended to document exposure to and the effects of hydrocarbons on Dungeness crabs

(*Cancer magister*) and brown king crabs (*Lithodes aequispinosa*). Although a substantial sample of Dungeness crabs was obtained from eastern PWS, only a single crab was caught in western PWS. The investigator attributed the lack of crabs in western PWS to otter predation. With respect to brown king crabs, the investigator caught a substantial sample in western PWS. Some baseline data on rates of injury (limb loss can be a result of oil exposure) and other parameters were obtained, but there was no clear indication of injury from the oil spill. The study was discontinued after the initial year, 1989.

Fish/Shellfish Study No. 18 (Haynes et al. 1995) addressed "Impacts of the *Exxon Valdez* Oil Spill on Bottomfish and Shellfish in Prince William Sound." Much of this study concerned bottomfish (e.g., walleye pollock, *Theragra chalcogramma*), but there were some data on sidestripe shrimp (*Pandalopsis dispar*) and Tanner crab (*Chionoecetes bairdi*). A post-spill bottom trawl (1989) in PWS was compared with a similar survey in 1978. There were fewer tanner crabs (i.e., lower CPUE) in the 1989 survey than in 1978. Sidestripe shrimp had just the opposite pattern--there were more shrimp in the postspill survey. There is no clear interpretation of these data with respect to EVOS.

Fish/Shellfish Study No. 19 (Norcross) addressed "Injury to Larval Fish in Prince William Sound." In 1989, larval crustaceans and fish were collected on six cruises in Prince William Sound. Although some of the initial sorting of samples was accomplished, the study was terminated. No funds were provided to complete the identification and analysis of the samples.

Fish/Shellfish Study No. 22 (Freese and O'Clair 1995), addressed "Injury to Crabs Outside Prince William Sound." During 1989 and 1990, the investigators sampled bottom sediments and Dungeness crabs at numerous sites around Kodiak I. and on the eastern Alaska Peninsula. Eight of 15 sites at which crabs were caught had low levels of petroleum hydrocarbons in the sediment, but the residues at only two of the sites could be linked convincingly to EVOS. None of the crab tissues samples at any site showed evidence of hydrocarbon contamination. Thus, there was no evidence of EVOS injury to Dungeness crab in the Kodiak/eastern Alaska Peninsula area.

Finally, the Exxon Corporation also supported at least one study on the effects of the oil spill on crustaceans in Prince William Sound. Analyses of muscle tissues in Tanner crab and spot shrimp by Armstrong et al. (1995) generally showed low concentrations of total polyaromatic hydrocarbons (PAHs) in both oiled and unoiled samples from Prince William Sound. During one cruise in 1990, some localized mortality of juvenile Tanner crabs was documented, but the authors speculate that low bottom-water salinity may have been at least part of the cause. There was a statistically significant difference in the fecundity of coonstripe shrimp between oiled and unoiled areas in 1989-90, apparently due to the oil spill, but the authors do not believe that the difference was consequential given the population dynamics of the species.

Stock Status

Gulf of Alaska crab stocks are generally depressed, though the details depend on the specific area (stocks can even vary bay-by-bay) and species. Generally speaking, red king crab (*Paralithodes*

camtschaticus) stocks have been depressed since the early 1980s, and the Kodiak red king crab fishery has been closed since 1983. Most Tanner crab stocks have become depressed more recently. Both red king and Tanner crab stocks are at least fairly healthy in SE Alaska.

Aside from fish tickets and dockside samples, Dungeness crab stocks are not assessed. Catch records, however, show that landings from SE Alaska, Yakutat, and Kodiak tend to cycle in ways similar to well-known cycles of Dungeness crab populations from northern California to BC. Dungeness crabs at the northern end of their range (Prince William Sound and Lower Cook Inlet) are quite depressed, however. Stocks in PWS crashed well before the spill, and there is a common perception that sea otter predation is at least partially responsible. New fisheries have developed for other species of deepwater king and Tanner crabs, but these stocks are not assessed either.

In regard to shrimp, historically, the principal species harvested was the pink shrimp (*Pandalus borealis*). Many of these fisheries and stocks crashed in the early 1980s. A fairly stable beam-trawl shrimp fishery has been sustained over many years in SE Alaska, and there are some fairly small pot and trawl fisheries for other shrimp species in the eastern and central Gulf of Alaska.

In addition to information provided by Gordon Kruse, the work by Paul Anderson, National Marine Fisheries Service, and his colleagues is pertinent (Anderson et al. 1996). As part of the Alaska Predator Ecosystem Experiment project, Anderson et al. (1996) are reviewing data from NMFS and ADFG historical small-mesh trawl surveys to examine changes in the composition and abundance of forage fish and other marine life. This work is in progress, but preliminary results give evidence of important shifts among the major species groups in the Gulf of Alaska. Beginning in the late 1970s, there was an abrupt change from catches dominated by shrimp species to large proportions of fish, especially pollock, cod, and flatfish of several species, including Pacific halibut (*Hippoglossus stenolepis*) and arrowtooth flounder (*Atheresthes stamius*). The data from these research trawls correspond rather closely with the rapid declines in commercial landings of shrimp and then crab in the Gulf of Alaska. These changes may be linked to an increase in water temperature of about 2° C during the same time period, but the relationship between the ecological and oceanographic changes still is being explored.

Current Restoration, Research, and Management Activities

Management strategies have become more conservative for crabs and shrimps since their stocks crashed. Typically, managers tend to apply a fishery threshold to depressed stocks such that no fishing occurs when the stock falls below some level. Just this year ADFG implemented a new rebuilding strategy for the depressed red king crab stock in Bristol Bay and is working with the North Pacific Fishery Management Council to implement area closures to minimize impacts of groundfish trawling on these stocks. There has been some research towards enhancement of red king crabs via hatcheries (mostly Japanese researchers), but there may be little prospect that this approach is economically or biologically practical for Alaskan stocks.

Research on crab and shrimp in Alaska is conducted principally by ADFG, NMFS, and the University of Alaska Fairbanks. The University of Washington also has a history of crab research in Alaska. The most coordinated work is conducted on king and Tanner crabs, and there is a long-term research plan in place. Because federal funds support crab research, most of the work is directed toward stocks in the Bering Sea-Aleutain Island area, though some of the work applies to all stocks. The research has been directed at four principal areas of investigation: (1) stock identification--mainly allozyme and DNA-level genetic studies, (2) population estimation--mainly additional surveys on previously unsurveyed stocks and development of length-based models to improve population estimates, (3) studies of stock productivity--several studies of reproductive dynamics of king and Tanner crabs (e.g., importance of male size and shell condition), simulation of population dynamics including growth and mortality changes over time, studies of handling mortality, and investigations of stock-recruit and environment-recruit dynamics, and (4) harvest strategies--analyses through simulation modeling.

Studies on Dungeness crabs are very limited. The most recent studies have been conducted by UAF and NMFS in collaboration with the National Biological Service in Glacier Bay National Park--stock structure, reproductive condition, relationships with sea otters, etc. Most research on Dungeness crabs has been conducted in the west coast states and in BC. Alaska has not funded research on Dungeness crabs to any significant degree.

Studies on shrimp are limited outside of assessment surveys by ADFG and NMFS, although UAF is currently conducting a length-based analysis of the Kachemak Bay shrimp stock in coordination with ADFG. As with Dungeness crabs, Alaska has not funded a meaningful research program on shrimp, and very little is known about the status and even basic biology of key shrimp species.

One of the difficulties posed by depressed crab and shrimp populations is that it becomes difficult to justify requests for survey funds when funds are so limited and competition for dollars is intense. In regard to the small-mesh trawl surveys described on page 3, NMFS conducts annual surveys of Pavlof Bay, but this survey is in constant jeopardy of elimination due to reduced funding. The surveys carried out by ADFG are annual, but budget constraints have forced the agency to rotate the surveys through a series of bays (e.g., Kachemak Bay) on a triennial cycle: Each area is only surveyed once every three years rather than annually as had been the case.

Future Restoration and Enhancement Activities

There is so much that is not known about the biology and population dynamics of crabs and shrimp that it is hard to recommend a particular restoration-enhancement activity. If the goal is to provide new fishing alternatives on underutilized crab and shrimp species, then that goal would dictate one set of research projects. On the other hand, if the goal is to restore and maintain king and Tanner crab stocks, then that would dictate a very different set of research projects.

The goal for developing fisheries probably would lead to basic investigations of distribution, reproduction, growth, and mortality, since there currently is not enough information to support development of biologically-based management strategies for new resources. This could be a prime area for experimental management.

The goal of king and Tanner crab restoration could involve studies on basic ecology and life histories and possible causes for depressed populations. These might include further studies of reproductive dynamics, distributions, and biological communities associated with crab nurseries in relation to groundfish trawling and scallop dredging, role of groundfish predation on crab recruitment, and environmental factors that regulate recruitment processes. There might be a role for lab work with flowing seawater systems as well as field work. (Perhaps this is something that could be done at the Alaska SeaLife Center?) Comparisons between depressed (e.g., Kodiak and Cook Inlet) stocks with healthy stocks (e.g., SE AK) outside the spill area could be most insightful, and the Trustee Council has supported similar comparisons on harbor seals (*Phoca vitulina richardsi*).

In the Kodiak area, Pengilly and Donaldson mentioned a need to describe the geographic distribution of settling habitats for crabs. Once identified, prime settling habitats--areas that might serve as local "source" populations--might warrant special protection (e.g., in the event of another oil spill). There also is need for studies that tie crab settlement and recruitment with crab numbers 5-7 years later. Use of laser line scanning equipment might lead to improvements in stock assessments. Finally, in terms of an experimental approach, there might be value in fishing out a bay, and then seeing what happens to crustacean populations (this would tie in with the results of Anderson et al. on the possibility of a shift in ecosystem composition).

Aspects of the Trustee Council's Sound Ecosystem Project (SEA, /320) should prove to be valuable for crab and shrimp research and management. For example, models of physical oceanography (e.g., circulation patterns) and larval herring drift can be tested on the planktonic larvae of crab and shrimp, thus helping to identify ecological processes and critical habitats of importance to crustaceans. In turn, this enhanced understanding should improve management and predictability. As another example, the SEA fish-predator consumption bioenergetic models might be useful in determining losses of young crab and shrimp to bottomfish, such as cod and pollock.

Conclusion

Although there may have been some injury to crab and shrimp as a result of the oil spill, the nature, degree, and scope of the injury is not known, certainly not on the basis of the EVOS damage assessment studies. Given that most shrimp and crab stocks in the oil-spill area had crashed well before EVOS, probably due to some change in oceanographic conditions and possibly, in some cases, to the effects of harvests, there is no evidence that the oil spill accounts for the current depressed status of crab and shrimp of importance to commercial and subsistence users.

In terms of restoration action, it may be justified to approach work on crab and shrimp from the standpoint of replacement or enhancement. This is a policy decision. It is also evident, however, that there is no project "on the shelf" that will in any immediate sense directly restore, replace, or enhance crab and shrimp resources, particularly if the initial cause of the crashes was environmental. Clearly, there is much that can be done in terms of basic research and stock assessment, which would undoubtedly pay off over the long term through development of new fisheries or improved management of existing fisheries. I see no prospect, however, for an immediate benefit to commercial and subsistence users.

In regard to a possible workshop on this topic, I am sure that a workshop would generate additional ideas in the way of specific needs and opportunities, but it also could raise expectations of a Trustee Council commitment to follow through on the ideas generated. I would be leery of going further unless you and the Trustee Council are prepared to consider a significant multi-year financial commitment to crab and shrimp studies.

The above discussion about how little is known about the status of crab and shrimp and how little actually is being done on these resources underscores for me the importance of sustaining the historical small-mesh trawl surveys now conducted by NMFS and ADFG. These surveys are critical for the insights they provide into the composition of the biota in the Gulf of Alaska ecosystem, including crab and shrimp as well as forage fish, which are a key part of several on-going Trustee Council projects. Perhaps we should consider the importance of sustaining or enhancing this work in the context of the Trustee Council's interest in encouraging and participating in long-term ecological research and monitoring in the Gulf of Alaska.

Finally, after completion of the current phase of the SEA project in 1999, the Trustee Council may want to consider opportunities for "spin-off" research on crab and shrimp. Such work could test and extend the SEA project and improve understanding and management of crab and shrimp populations in Prince William Sound.

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cc: Robert Spies, Chief Scientist
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Correspondence

Exxon Valdez Oil Spill Trustee Council

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MEMORANDUM

To: Stacy Studebaker

From: Stan Senner, Science Coordinator Stan

Subject: River otters at Alaska SeaLife Center

Date: August 4, 1997

Dr. Spies and I were both at the Alaska SeaLife Center (ASLC) last Friday for a meeting on equipment and bench fees, but we took advantage of the opportunity to meet with the ASLC staff and Dr. Merav Ben-David (from UAF), who is one of the principal investigators on the river otter project (98348).

Based on our discussions, Dr. Ben-David and the ASLC staff agreed to increase the aquatic and terrestrial spaces for the otters. This updates what I previously had mailed you from Dr. Ben-David. Here are the new plans:

1. A large round salt-water pool (4.5 m diameter x 3 m depth), with enhancements toprovide opportunities for play and exercise.
2. Two smaller salt-water pools (2 x 1.5 x 1.5 m).
3. Two smaller fresh-water pools (2 x 1.5 x 1.5m).
4. An area of 90 m^2 surrounding these pools. This area will be built in a manner that will allow sealing of sections in case we will need to isolate an animal from the rest of the group. This area will be entered through a double gate.

In addition, Dr. Ben-David suggested that I emphasize to you and others that their purpose here is to recreate and validate in a controlled setting the exposure of wild river otters to **chronic** rather than **acute** oil pollution. This is important because the whole point is that the doses of oil will be very small and not expected to cause visible injury. This is the situation in the wild, where the blood chemistry of apparently normal river otters is nonetheless showing signs of stress, possibly due to oil exposure.

I hope that this additional information is helpful as you consider the proposed project 98348. Thank you.

cc: Molly McCammon
Dr. Robert Spies
Dr. Merav Ben-David
John Hendricks

98348

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To: Molly McCammon, Executive director
From: Drs. Merav Ben-David and Terry Bowyer
Subject: Project 98348, Response of river otters to oil contamination
Date: July 21, 1997

This is in response to your questions that we received on July 18, 1997.

(1) We have requested 2 enclosures at ASLC that will contain one large salt-water pool (1.8 x 2 x 1.3 m / 943 gallons) and one small fresh-water pool (1.5 x 1 x 1 m). Eight otters will be kept in one enclosure and 7 in the other. The large salt-water pool will be used for swimming and diving whereas the fresh-water pool will provide the otters with rinsing water which is essential for maintaining the health of their fur. Each enclosure also will provide the otters with dry surface for terrestrial locomotion (the exact dimensions will be determined during our meeting in Seward on Aug. 1). Each otter will be provided with a wooden den lined with straw. Most of the activity of otters in the wild is in the from of swimming and diving, therefore providing the otters with facilities that will allow them to swim and dive will help to maintain their good health. We plan on allowing the otters free access to the water at all times except during those times we will anaesthetize them. In the wild, males usually travel and forage in groups. We believe that holding the otters in groups will be beneficial to them as it will enable them to interact socially and play. Otters living in marine environments are not territorial. In the first stages of introducing the otters to captivity, we will control interactions between the otters by using portable fences inside the enclosure and monitoring the behavior of the animals. We have been successful in introducing other mustelids to captivity in similar situations and are planning on drawing heavily on the experience of Dr. Hans Kruuk who has successfully maintained wild European otters in captivity.

(2) a. We intend to conduct behavioral observations on the otters before and after oil administration. These observations will include dive duration, recovery time, and capture success of prey. By comparing those variables of before and after exposure as well as comparing oiled to non-oiled otters, we will determine the animals ability to survive in the wild. Also, we will compare the blood chemistry of the captive otters with those obtained from wild otters in oiled areas and use the range of values from wild otters as a cutoff value. Lastly, we will be working closely with the ASLC veterinarians and consult with them on the issue.

b. Before releasing any of the animals back to the wild we will screen them for the common diseases contracted by wild carnivores. Such screening is conducted on a

regular basis by Randy Zarnkin from ADFG in Fairbanks and he has previously analyzed samples of mustelids we provided him.

(3) The captive otters will be in captivity between 9 and 11 months . Their release date will depend on weather condition in PWS in early spring 1999. We would prefer to optimize the release time such that the otters will be released in comparatively warm weather and high food abundance.

(4) We plan on capturing otters in Esther Passage, Squaw Bay, Unakwik Inlet and adjacent areas. The estimated population size for these areas is 28 - 80 otters per 100 km of shoreline based on Testa et al. (1994). During our survey of latrine sites during 12 - 19 Aug. 1996 we have been able to directly observe 7 individual river otters in Esther Passage. In comparison, During the same period only 2 individuals were observed in Jackpot Bay where 19 river otters were successfully live-trapped by Gail Blundell. This suggests that no major decline in population of otters in this area has occurred since 1990. The removal of male otters from this wide area is unlikely to have effects on the population dynamics of this polygynous mustelid.

Exxon Valdez Oil Spill Trustee Council

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

MEMORANDUM

To: Drs. Terry Bowyer and Meray Ben-David

From: Molly McCammon, Executive Director

Subject: Project 98348, Response of River Otters to Oil Contamination

Date: July 18, 1997

On July 16 we briefed members of the EVOS Public Advisory Group (PAG) about the draft FY 1998 Work Plan, including Project 98348, Response of River Otters to Oil Contamination. As you know, there has been considerable interest in the river otter/oil project, and we had an extended, thoughtful discussion about it. Although the PAG has endorsed the draft FY 1998 Work Plan, there are some questions about Project 98348 that neither Bob Spies nor Stan Senner could answer. These questions are:

(1) What is the design of the pens and housing for the river otters? This question stems from an awareness of how vigorous a group of male river otters is likely to be.

(2) The plan is to release the river otters back into the wild after completion of the project. Any otters experiencing minor but noticeable damage would be retained in captivity; any animals experiencing pain and suffering would be euthanized. Would you describe the "exit" criteria in more detail? In particular, how will you know whether an animal is sufficiently healthy to be released back into the wild? How would you ensure that no diseases picked up in captivity would be introduced into the wild population?

(3) For those river otters which are to be released, how long will they be in captivity?

In addition, I have a final question of my own:

(4) Your plan is to capture the experimental otters in unoiled portions of western Prince William Sound. Would you provide more information about the likely capture areas and summarize any information you may have about the status of the otter population in those areas?

The Trustee Council meets on August 6 to act on the draft FY 1998 Work Plan. If at all possible, I would like to have your reply in advance of this meeting. If this is not possible, would you let me or Stan Senner know when you will be able to reply? Thank you.

MM/kh

cc: John Hendricks, ASLC
Dr. Mike Castellini, ASLC/UAF
Dr. Robert Spies, Chief Scientist
Stacy Studebaker, PAG member
Claudia Slater, ADFG

July 24, 1997

Molly McCammon, Executive Director
EVOS Trustee Council
645 G. Street, Suite 401
Anchorage, AK 99501-3451

via facsimile 276-7178

Dear Molly,

I just wanted to briefly follow up on my April 5, 1997 letter to you asking for information regarding Trustee Council research on the Exxon Valdez oil spill.

As it has been almost four months since I sent my request and I have not received a response as yet, I want to reiterate the request. I have attached a copy of the April 5 letter for your review.

This information is necessary for a document I am preparing regarding the oil spill. I know you folks have been busy, but if your science review has indeed been as thorough as you stated in your April 1 letter (and I'm assuming that the April Fools Day date of your letter was entirely coincidental and not meant to convey a message regarding the validity of your assertions in the letter), then the answeres to my questions should be readily available.

As I stated in April, I am very anxious to receive your review's answeres to these questions. I would appreciate having your response as soon as possible, and I would appreciate you scheduling a discussion of this issue at your August 6 Trustee Council meeting. This is an issue of great public interest, and I appreciate your serious consideration of my request.

Thanks,

Rick

Rick Steiner
The Coastal Coalition
9940 Nearpoint Dr.
Anchorage, AK 99507
907-333-3381

cc Trustee Council, and PAG

April 5, 1997

Molly McCammon, Executive Director
EVOS Trustee Council
645 G. St. Suite 401
Anchorage, AK. 99501-3451

Dear Molly,

Thankyou for your April 1 letter to me regarding my request, for over four years, that the Trustee Council commission a truly independent, credible, and comprehensive assessment of EVOS science. Your announcement that the enormous government EVOS science program has already been independently, comprehensively, and credibly reviewed is great news. I, and many others, were unaware of this. I have been waiting for the answeres to many questions concerning the program, and I am elated that your independent, comprehensive, and credible review can now provide them.

In light of your assertion that "no other research program in the country has this much independent scrutiny" and that you have "independent reviewers who are familiar with the entire program", I would appreciate receiving their and your detailed answeres to the following questions:

1. Precisely how have your research results been used to aid the recovery of the injured ecosystem? Please provide me with your review's itemized list of exactly what restorative management decisions have been made based on your research, by which agency, and at what date. Please attach copies of each and every such decision.

2. What is the total amount of public funds that have been expended to date on government EVOS research? Please provide me with your review's itemized accounting of all such expenditures, including all equipment that has been purchased using EVOS funds, what its ultimate disposition has been, and how the present use of that equipment is benefiting the recovery of the injured ecosystem.

3. Precisely what amount of public funds were taken out of the settlement as reimbursements to the State and Federal governments for damage assessment and restoration planning, response and cleanup costs, and litigation costs? Please provide me with an itemized accounting of all such expenditures, and your review's assessment of the efficacy and legitimacy of these expenditures in fulfillment of the U.S. District Court ordered Consent Decree.

4. To what extent have settlement funds within your control gone to fund activities that were either ongoing or were contemplated to be funded before the spill occurred? That is, exactly how much money did you spend on efforts that would reasonably be considered to be normal agency repsonsibilities? Please provide me with your review's detailed accounting of this issue.

5. What is your review's conclusion regarding the allocation of funds between various components of injured ecosystem research? Please provide me with your complete assesment of the issue of balance and inclusion in your research program - i.e., what significant questions were not addressed, what insignificant ones were?

6. What has your comprehensive, independent review concluded concerning issues such as agency bias, conflict of interest, duplication of effort, openness and competetiveness of the RFP process, and general fairness in the conduct of your research program since March, 1989? Please provide me with the detailed results of your assessment regarding this issue.

7. Precisely how much money have you provided out of the settlement in overhead to your own agencies? Please provide me with an accurate accounting of all overhead allocations you have made in the purported interest of restoration.

7. Considering the level of funding allocated and the overhead rates charged, were the results of each individual project you sponsored commensurate with the funding provided? Please provide me with your review's detailed assessment of this issue.

8. Precisely how has the Department of Justice, the Alaska Department of Law, and Exxon influenced your science program? Was it in the public interest to keep early NRDA results confidential? Had the NRDA case gone to trial, would your scientific results have been provable and defensible? Please provide me with your detailed assessment of this issue.

9. Did your government science program provide sufficient scope and rigor to support the 30,000 or so privant plaintiffs, as you had agreed in your out-of-court settlement with them? Please provide me with your review's assessment of this inportant legal issue.

10. Precisely what mechanism have you established to monitor the compliance of any future expenditure of settlement funds with the U.S. District Court ordered Consent Decree by which you are operating? What accounting proccedure have you established by which the public and the court may determine that all such expenditures - i.e., at the Alaska Sea Life Center, from the Restoration Reserve, etc. - are in accordance with the court's order?

11. Given the results of your ongoing, comprehensive, credible, and independent review, what have we as a society learned from this disaster and how should we as a society respond better next time? Precisely how has your enormous expenditure of public funds helped to advance the present human condition? Please provide me with your detailed review of this, the ultimate question.

I am elated and excited that you will be able to immediately provide me with all of the above information, as a result of your existing review process.

Anxiously,

Rick Steiner, The Coastal Coalition
9940 Nearpoint Dr.
Anchorage, AK 99507

Exxon Valdez Oil Spill Trustee Council

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

April 1, 1997

Rick Steiner
Seagrant Marine Advisory Program
Carlton Trust Building, #110
2221 E. Northern Lights Boulevard
Anchorage, Alaska 99508-4140

Dear Rick:

The Trustee Council has asked me to respond to your February 19 letter regarding a National Academy of Sciences (NAS) review of the Council-funded science program.

We agree that a "credible, comprehensive, independent review and assessment of *Exxon Valdez* Oil Spill (EVOS) science" is important. For that reason, we are expending nearly $400,000 a year ($2.7 million total since 1991) for a scientific peer review process headed by an independent contractor. This process relies strongly on five other scientists, all highly regarded in their fields, several of whom have served on prior National Academy of Sciences reviews. In addition, a team of approximately 50 scientists is used to peer review individual project proposals and reports.

Each year we hold a three-day workshop in Anchorage to review the results of the prior season's field work and discuss the needs of the upcoming year. This workshop is supplemented by several more intensive review sessions attended by specialized reviewers. To our knowledge, no other research program in the country has this much independent scrutiny. The fact that we have independent reviewers who are familiar with the entire program provides a depth of knowledge and understanding that could not be obtained in any other way.

The Trustee Council is satisfied with the independent review the program currently receives. However, we would be happy to cooperate and assist in a NAS review if funds were provided from some other source.

As we prepare for the 10th anniversary of the spill and the transition into funding from the Restoration Reserve, our science review team has been considering other potential review tasks in the future. One might be a review in 2001 of the results of the 10 years of scientific research under the settlement, especially the three major ecosystem projects.

Another review that may have value in the future is to compare the research, monitoring and restoration under the EVOS process with the restoration programs under the new OPA 90 damage assessment and restoration regulations. However, it is unlikely such a review could be funded by the Trustee Council given the terms of the settlement agreement.

In summary, Rick, we agree with your premise of the need for credible independent scientific review. We believe we are achieving that -- and more -- with the current process.

Thank you for your interest in the program.

Sincerely,

Molly McCammon
Executive Director

cc: Trustee Council members
Dr. Robert Spies
Dr. Charles Peterson
Dr. George Rose
Dr. Christopher Haney
Dr. Philip Mundy
Ms. Polly Wheeler

mm/raw

Sea Grant Marine Advisory Program

University of Alaska Fairbanks

School of Fisheries and Ocean Sciences

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February 19, 1997

TO: EVOS Trustee Council 3 pages by fax 276-7178

FR: Rick Steiner RS

RE: NAS review of EVOS science

Hi folks. Regarding my request, for over four years now, to have the EVOS Trustee science program reviewed by the National Academy of Sciences, I wanted to make sure you all had seen the language, as amended, in OPA-90 concerning the Oil Spill Recovery Institute. Section 5001 c) 4), provides for a NAS review of the OSRI science program every 5 years.

The OSRI science program should amount to about a $5 - $10 millic program over a five year period. Obviously, Congress has conclud that such a significant scientific program should be credibly and independently scrutinized periodically.

The government science program concerning the EVOS has, to date, amounted to approximately a $300 million expenditure, and has tru international significance, and historic significance.

Your continued objection to sponsoring a similar review of your science program to that of OSRI's is very peculiar. I would have hoped that you might have felt a similar sense of pride and confidence in your much larger research program.

It is my understanding that, while you publicly maintain that you are all "still talking about it", you have decided not to pursue such review. I would appreciate hearing from you concern you conclusions and rationale for them on this issue. I would like to bring this issue to closure by the anniversary, March 24.

The question I would appreciate having answered, once and for all is as follows:

> Do you or do you not wish to sponsor a credible, comprehensive independent review and assessment of EVOS science.

I will eagerly await your response.

**NOTE: This includes revisions of the Coast Guard Authorization Act of 1996 which was signed by the President on October 19, 1996.*

PUBLIC LAW 101-380-AUG. 17, 1990
TITLE V- PRINCE WILLIAM SOUND PROVISIONS*

Sec. 5001 OIL SPILL RECOVERY INSTITUTE

a) ESTABLISHMENT OF THE INSTITUTE -
The Secretary of Commerce shall provide for the establishment of a Prince William Sound Oil Spill Recovery Institute (hereinafter in this section referred to as the "Institute") through the Prince William Sound Science Technology Institute located in Cordova, Alaska.

b) FUNCTIONS-
The Institute shall conduct research and carry out educational and demonstration projects designed to-

1) identify and develop the best available techniques, equipment, and materials for dealing with oil spills in the Arctic and subarctic marine environment; and
2) complement Federal and State damage assessment efforts and determine, document, assess, and understand the long range effects of Arctic or subarctic oil spills on the natural resources of Prince William Sound and its adjacent waters (as generally depicted on the map entitled "Arctic or subarctic oil spills dated March 1990"), and the environment, the economy, and the lifestyle and well-being of the people who are dependent on them, except that the Institute shall not conduct studies or make recommendations on any matter which is not directly related to Arctic or subarctic oil spills or the effects thereof.

c) ADVISORY BOARD-

1) In general - The policies of the Institute shall be determined by an advisory board, composed of 16 members appointed as follows:
   A) One representative appointed by each of the Commissioners of Fish and Game, Environmental Conservation, and Natural Resources, of the State of Alaska, all of whom shall be State employees.
   B) One representative appointed by each of the Secretaries of Commerce, the Interior, and Transportation, who shall be Federal employees.
   C) Two representatives from the fishing industry appointed by the Governor of the State of Alaska from among residents of communities in Alaska that were affected by the EXXON VALDEZ oil spill, who shall serve terms of 2 years each. Interested organizations from within the fishing industry may submit the names of qualified individuals for consideration by the Governor.
   D) Two Alaska Natives who represent Native entities affected by the EXXON

VALDEZ oil spill, at least one of whom represents an entity located in Prince William Sound, appointed by the Governor of Alaska from a list of 4 qualified individuals submitted by the Alaska Federation of Natives, who shall serve terms of 2 years each.

E) Two representatives from the oil and gas industry to be appointed by the Governor of the State of Alaska who shall serve terms of 2 years each. Interested organizations from within the oil and gas industry may submit the names of qualified individuals for consideration by the Governor.

F) Two at-large representatives from among residents of communities in Alaska that were affected by the EXXON VALDEZ oil spill who are knowledgeable about the marine environment and wildlife within Prince William Sound, and who shall serve terms of 2 years each, appointed by the remaining members of the Advisory Board. Interested parties may submit the names of qualified individuals for consideration by the Advisory Board;

G) One nonvoting representative of the Institute of Marine Science.

H) Or nonvoting representative appointed by the Prince William Sound Science and Technology Institute.

2) CHAIRMAN -

The representative of the Secretary of Commerce shall serve as Chairman of the Advisory Board.

3) POLICIES -

Policies determined by the Advisory Board under this subsection shall include policies for the conduct and support, through contracts and grants awarded on a nationally competitive basis, of research, projects, and studies to be supported by the Institute in accordance with the purposes of this section.

4) SCIENTIFIC REVIEW -

The Advisory Board may request a scientific review of the research program every five years by the National Academy of Sciences which shall perform the review, if requested, as part of its responsibilities under section 7001 (b) (2).

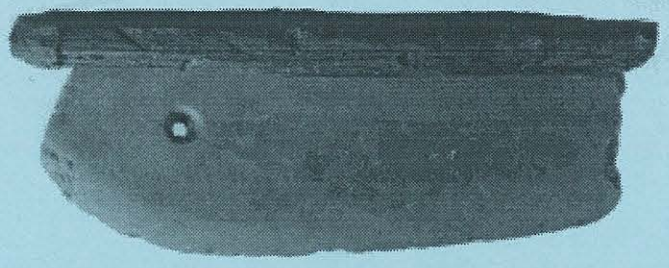
d) SCIENTIFIC AND TECHNICAL COMMITTEE -

1) IN GENERAL -

The Advisory Board shall establish a scientific and technical committee, composed of specialists in matters relating to oil spill containment and cleanup technology, Arctic and subarctic marine ecology , and the living resources and socioeconomics of Prince William Sound and its adjacent waters, from the University of Alaska, the Institute of Marine Science, the Prince William Sound Science and Technology Institute, and elsewhere in the academic community.

The *Exxon Valdez* Oil Spill Trustee Council's

Public Advisory Group



Kodiak Field Trip

September 10-11, 1997

with meetings in

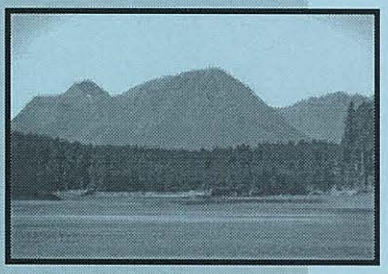
Kodiak

Larsen Bay

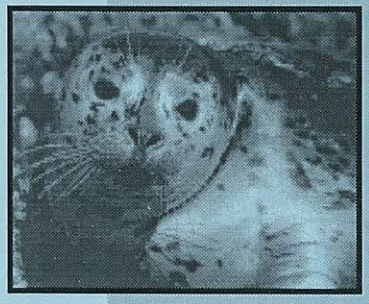
Old Harbor

Port Lions

Fisheries



Habitat Protection



Subsistence

Archaeology

Research & Monitoring

Recreation