

LEGACY
OF AN OIL SPILL
10 YEARS
AFTER
EXXON VALDEZ



EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
1999 STATUS REPORT





Tourism in the spill area is at record highs and recreation opportunities are improving, largely due to the addition of public lands through habitat protection programs and improved facilities for hikers, campers, and sport fishing enthusiasts.

Photo by Roy Corral

have specific recreational significance, such as the Overlook Park tract near Homer and the Lowell Point parcel in Seward. In addition, in an effort to preserve the world-class fisheries on the Kenai River, the Council is in the process of protecting roughly 1,800 acres along the river and its watershed and has contributed nearly \$2 million to riverbank restoration projects.

The State of Alaska dedicated over \$10 million of its criminal settlement with Exxon to improve recreational facilities throughout the spill area. Improvements include trails, cabins, boat launches, interpretive displays, and campsites. In addition, the Trustee Council has funded U.S. Forest Service development of a human-use model for western Prince William Sound. This model will aid planning for and mitigation of human uses so that injured species continue to be protected. The model may also assist in planning for future recreation needs in the sound.

Passive Use

Passive use encompasses "non-use" values, such as the appreciation of the aesthetic and intrinsic values of undisturbed areas and the value derived from simply knowing that a resource exists. Injuries to passive use are tied to public perceptions of injured resources. Because recovery of a number of injured resources is incomplete, the Trustee Council considers passive use, as a lost or reduced service, to be recovering, but not fully recovered from the spill.

The Trustee Council continues to use a multi-faceted approach to inform the public about the ongoing recovery and lack of recovery in the spill region. Through media-related efforts and public involvement in the process, public perception about the spill region should improve as more progress is made toward recovery and restoration.











Key Questions; Important Answers

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Cover Photos: Nothing symbolizes the Exxon Valdez spill more than the oiled birds and sea otters that were the focus of unparalleled rescue efforts. The gull on the cover likely got oil over its feathers while trying to feed on oiled carcasses on the beach. If rescued, the gull had a slight chance of survival. Without rescue, it had no chance at all. Photo by Natalie Fabes, 1989.

Inset photos: Marbled murrelet, photo by Gus Van Vliet, Shuyak Island, photo by Daniel Zatz; Commercial fishing, oiled glove, sea otter, photos by Roy Corral.

Pages 2 and 3: A powerboat cuts a wake through the oil as oil spreads in all directions during the calm of the first days. The Exxon Valdez sits atop Bligh Reef, just off Bushy Island, as oil remaining on the vessel is being off-loaded by the Exxon Baton Rouge. Photo by Natalie Fabes, 1989.

Pages 4 and 5: The cleanup along hundreds of miles of shoreline took four summers and cost about \$2 billion. Nearly 10,000 people were hired during the peak of the 1989 cleanup. Photo by Natalie Fabes, 1989.

Page 6: Experimental chemical treatments took place in 1993 which loosened the weathered oil and allowed it to be picked up using absorbent materials. Sheen covers a small patch of Fucus or seaweed at one site on Sleepy Bay. Photo by Natalie Fabes, 1993.

Above: A common murre covered in oil in 1989 was easily captured by rescue workers. The bird later died. Photo by Natalie Fabes, 1989.

Photographer Natalie Fabes covered the spill in 1989 and again in 1993 for National Geographic Magazine.



Ecosystem research is providing a base of information to help fisheries managers better understand the complex interactions that impact salmon, herring and other important fish.
Photo by Natalie Forbes

Alaskans were preparing for a peaceful Easter weekend 10 years ago when the *Exxon Valdez* ran hard aground, gushing millions of gallons of crude oil into one of our state's most spectacular and sensitive areas. For months, America was gripped by images of pristine shorelines awash in oil; birds and sea otters blackened to death. Some species have not fully recovered. Many Alaskans still bear the scars of the Good Friday spill.

Yet, as we assess the damage suffered and lessons learned, one truth rises above all: We are committed to pay the price of vigilance because we know the cost of complacency.

Since the spill and continuing today, Alaskans are working together to develop the world's safest oil transportation system. Picture the night and day differences between 1989 and today:

- Oil-laden tankers in Prince William Sound are now escorted by two vessels capable of responding quickly in case of an emergency. The world's largest tractor tugs will be put in service during 1999 to provide emergency steering, braking and towing for TAPS tankers. Three new prevention and response tugs will soon replace older spill response vessels while improving emergency towing and other assistance

Foreword

By Governor Tony Knowles

for tankers. These five new tugs represent a capital investment in spill prevention and risk reduction of more than \$60 million.

- The U.S. Coast Guard now watches every tanker traveling in the sound using a satellite surveillance system. The new system is so advanced the Coast Guard can actually detect from their control room if a tanker begins to drag its anchor 35 miles away.
- The location and type of instruments used to monitor winds and seas have been improved to alert the Coast Guard when sailing conditions warrant shutting down tanker traffic.
- State-licensed marine pilots are now in command of each tanker as they move through the sound. Pilots, tanker masters and escort boat captains train together in a marine simulator under mock Prince William Sound conditions to hone the fast reactions necessary to save a floundering tanker.
- By the year 2015, all tankers transporting oil from the Alyeska terminal must be double-hulled. ARCO has begun construction of three new "Millennium Class" advanced technology double-hull tankers, with the first scheduled to arrive in the year 2000.

- The State of Alaska has the world's toughest oil spill prevention and response laws, which require Alyeska Pipeline Service Company to maintain the nation's largest arsenal of spill response equipment. This huge reserve, including 60 skimming systems, 34 miles of oil containment boom and 450 fishing boats on contract, can clean up 300,000 barrels of oil in three days.
- Today, a well practiced Incident Command System brings together the Coast Guard, the state and the responsible party during a spill to unify the response and make effective use of resources during the critical stages of an emergency.

On another front, we have made giant leaps in our knowledge of the marine environment. Our knowledge of fisheries in Prince William Sound has advanced by at least 50 years due to the intense studies of the last 10 years. With the \$900 million Exxon civil settlement, scientists now better understand the survival needs of salmon

and herring and have developed better tools to help fisheries managers make accurate, more timely decisions.

In 1989, Alaskans were unprepared to gauge the damage from the spill because we had very little information about most bird and mammal populations. Today, we understand far better the role each species plays in the ecosystem.

Through the efforts of the Exxon Valdez Oil Spill Trustee Council, more than 300 salmon streams, vital old-growth forests necessary for nesting marine birds, and about 1,400 miles of shoreline have been protected. The Trustee Council has invested millions of additional dollars to restore trampled riverbank on the Kenai River and has acquired more than eight miles of riverbank for public use and protection.

History will judge the Exxon Valdez oil spill as a disaster that should and could have been prevented. But the legacy of this spill also will be about people working together to restore the injured environment and to prevent anything like it from ever happening again.



Commercial fisheries throughout the spill region were idled due to the threat of contamination from oil in 1989. Restoration programs conducted by the Trustee Council have benefited commercial fisheries by advancing scientific knowledge about these fisheries, providing better tools so that fisheries managers can make better decisions, protecting salmon streams, and improving salmon spawning and rearing habitats.

Photo by Rob Schaefer



It's estimated that 250,000 seabirds were killed by floating oil in the weeks and months following the spill.

Photo by John Lough

What was the settlement with Exxon?

How is the \$900 million civil settlement being used?

The settlement among the State of Alaska, the United States government and Exxon was approved by the U.S. District Court on October 9, 1991. It resolved various criminal charges against Exxon as well as civil claims brought by the federal and state governments for recovery of natural resource damages resulting from the oil spill. The settlement had three distinct parts:

Criminal Plea Agreement. Exxon was fined \$150 million, the largest fine ever imposed for an environmental crime. The court forgave \$125 million of that fine in recognition of Exxon's cooperation in cleaning up the spill and paying certain private claims. Of the remaining \$25 million, \$12 million went to the North American Wetlands Conservation Fund and \$13 million went to the national Victims of Crime Fund.

Criminal Restitution. As restitution for the injuries caused to the fish, wildlife, and lands of the spill region, Exxon agreed to pay \$100 million. This money was divided evenly between the federal and state governments.

Civil Settlement. Exxon agreed to pay \$900 million with annual payments stretched over a 10-year period. The settlement has a provision allowing the governments to make a claim for up to an additional \$100 million to restore resources

that suffered a substantial loss, the nature of which could not have been anticipated from data available at the time of the settlement.

Exxon Valdez Oil Spill Trustee Council

The Exxon Valdez Oil Spill Trustee Council was formed to oversee restoration of the injured ecosystem through the use of the \$900 million civil settlement. The Council consists of three state and three federal trustees (or their designees):

STATE

Commissioner
Dept. of Fish and Game

Commissioner
Dept. of Environmental
Conservation

Attorney General
Dept. of Law

FEDERAL

Secretary
Dept. of the Interior

Director
National Oceanic &
Atmospheric Admin.

Secretary
Dept. of Agriculture

The Trustee Council adopted a Restoration Plan in 1994 after an extensive public process that included meetings in 22 spill-area communities as well as in Anchorage, Fairbanks and Juneau. More than 2,000 people participated in the meetings or sent in written comments.

Reimbursements. As part of the settlement agreement, \$173.2 million went to reimburse the federal and state govern-

Uses of Civil Settlement: 10 Years of Restoration

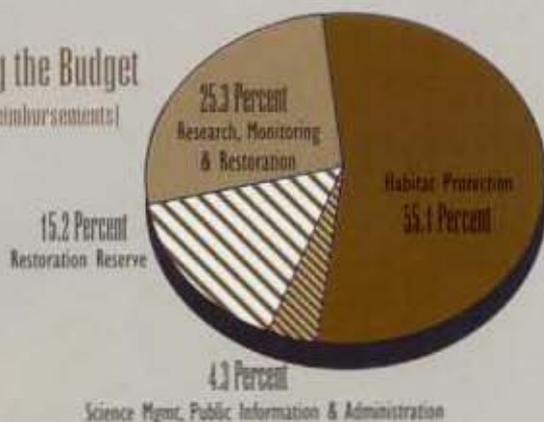
(in millions)

| | |
|---|--------------|
| REIMBURSEMENTS FOR DAMAGE ASSESSMENT AND RESPONSE | 213.1 |
| Governments (includes litigation and cleanup) | 173.2 (a) |
| Exxon (for cleanup after 1/1/92) | 39.9 |
| RESEARCH, MONITORING AND GENERAL RESTORATION | 180.0 |
| FY 1992 - FY 1999 Work Plans | 108.6 |
| FY 2000 - FY 2002 Work Plans (estimate) | 35.0 |
| Alutiq Museum (Kodiak) | 1.5 |
| Archaeological Repository/Exhibits (PWS & Kenai Pen) | 2.8 |
| Alaska SeaLife Center | 26.2 |
| Port Graham Hatchery | .8 |
| Reduction of Marine Pollution | 5.1 |
| HABITAT PROTECTION | 395.3 |
| Large Parcel and Small Parcel habitat protection programs (past expenditures, outstanding offers, estimated future commitments and parcel evaluation costs) | |
| RESTORATION RESERVE | 108.0 |
| FY 1994 - FY 1999 | 72.0 |
| FY 2000 - FY 2002 (anticipated) | 36.0 |
| SCIENCE MANAGEMENT, PUBLIC INFORMATION & ADMINISTRATION | 30.9 |
| FY 1992 - FY 1999 | 24.7 |
| FY 2000 - FY 2002 (estimate) | 6.2 |
| TOTAL | 927.3 |
| Exxon Payments | 900.0 |
| Interest on Court Registry Investment System (minus fees) | 27.3 |

(a) Reimbursement to governments reduced by \$2.7 million included in the FY 1992 Work Plan

Dividing the Budget

(after reimbursements)



As of February 15, 1999

Uses of Criminal Settlement

(in millions)

FEDERAL (highlights)

The federal government used most of its portion of the criminal settlement to help the Trustee Council fund habitat protection efforts, including:

| | |
|----------------------|--------|
| Akhiok Kaguyak, Inc. | \$10.0 |
| Chenega | \$10.1 |
| English Bay | \$ 1.3 |
| Koniag | \$ 7.0 |
| Old Harbor | \$ 3.3 |
| Tatidek | \$10.0 |

(See table on Page 37 for more information)

Small Parcel acquisitions of habitat within:

| | |
|---------------------------------|--------|
| Kodiak National Wildlife Refuge | \$ 3.9 |
| Chugach National forest | \$ 1.5 |
| Kenai National Wildlife Refuge | \$.5 |

Other federal uses include:

| | |
|----------------------|--------|
| Shoreline Monitoring | \$ 3.4 |
| Oil Spill Research | \$ 5.6 |
| General Restoration | \$.9 |

STATE OF ALASKA (highlights)

The State Legislature divided the money among capital improvements benefiting fisheries and research, habitat improvements, subsistence, and new recreational facilities.

| | |
|-------------------------------------|--------|
| Alaska SeaLife Center | \$12.5 |
| Kachemak Bay State Park | \$ 7.0 |
| Kachemak Bay St. Pk. Visitor Center | \$.5 |
| Seward Shellfish Hatchery | \$ 3.5 |
| Fort Richardson Hatchery | \$ 4.0 |
| State Park Recreational Facilities | \$10.9 |
| Kenai River Bank Restoration | \$ 3.0 |
| Main Bay Hatchery | \$ 2.0 |
| Fishery Industrial Technology Ctr. | \$ 3.0 |
| Subsistence Enhancements | \$ 6.2 |
| Spill Prevention/Response | \$ 2.6 |
| Tatidek and Chenega Docks | \$.6 |
| PWSAC Hatchery Operations | \$ 1.8 |
| Prince William Sound Science Center | \$.3 |
| Shepard Point Road | \$ 2.7 |
| Kenai Visitors Center | \$ 1.9 |
| Fish Stock Identification | \$ 1.0 |
| Port Graham Hatchery | \$.5 |



ments for costs incurred conducting spill response, damage assessment, and litigation. Another \$39.9 million went to reimburse Exxon for cleanup work that took place after the civil settlement was reached.

The remaining funds were dedicated to implementation of the Restoration Plan, which consists of five parts:

Research and Monitoring. Surveys and other monitoring of fish and wildlife in the spill region provide basic information to determine population trends, productivity, and health. Research increases our knowledge about the biological needs of individual species and how each contributes to the Gulf of Alaska ecosystem. Research also provides new information and better tools for effective management of fish and wildlife populations.

General Restoration. This category includes projects to protect archaeological resources, improve subsistence resources, enhance salmon streams, reduce marine pollution, and restore damaged habitats.

Habitat Protection. Protection of habitat helps prevent additional injury to species due to intrusive development or loss of habitat. The Trustee Council accomplishes this by providing funds to government agencies to acquire title or conservation easements on land important for its restoration value.

Restoration Reserve. This savings account was established in recognition that



The Alaska Sealife Center opened its doors in May 1998, combining education and tourism components with a modern marine laboratory. The civil settlement provided \$26.2 million and the state provided another \$12.5 million from the criminal settlement to help build the facility.

Photo by Chris Averil

full recovery from the oil spill would not occur for decades. The reserve fund will support long-term restoration activities after the final payment is received from Exxon in September 2001. The reserve is expected to be worth approximately \$140 million by that time. (See "Future of Restoration," Page 44.)

Science Management, Public Information & Administration. This component of the budget includes management of the annual work plan and habitat programs, scientific oversight of research, monitoring and restoration projects, agency coordination, and overall administrative costs. It also includes the cost of public meetings, newsletters and other means of disseminating information to the public.

Facing page: Hikers walk the trails of Afognak Island State Park, established in 1994 after acquisition of the Seal Bay and Tonki Cape areas of the island.

Photo by Ray Carroll



Have the species most injured by the spill recovered?

A harbor seal awaits tagging after capture in Prince William Sound

Photo by Roy Conrad

Ten years after the *Exxon Valdez* oil spill, it is clear that many fish and wildlife species injured by the spill have not fully recovered. It is less clear, however, what role oil plays in the inability of some populations to bounce back.

An ecosystem is dynamic — ever changing — and continues its natural cycles and fluctuations at the same time that it struggles with the impacts of spilled oil. As time passes, separating natural change from oil-spill impacts becomes more and more difficult.

NOT RECOVERING

There are eight species that continue to be listed as not recovering 10 years after the spill: **common loons, cormorants (pelagic, double-crested and red-faced), harbor seals, harlequin ducks, killer whales (AB pod), and pigeon guillemots.** The reasons behind their continuing problems, however, may vary.

Common loon

Current population sizes are not known for any of the four species of loons in the spill region. In general, however, loons are long-lived, slow-reproducing, and have small populations. Common loons in the spill area may number only a

few thousand, including only hundreds in Prince William Sound, yet carcasses of 395 loons were recovered following the spill, including at least 216 common loons. Boat surveys in the sound show no recovery through 1998.

Cormorant

Cormorants are large fish-eating birds that spend much of their time on the water or perched on nearby rocks. Three species typically are found within the oil-spill area: pelagic, double-crested, and red-faced. Post-spill counts showed significant declines in the estimated numbers of cormorants (all three species combined) in Prince William Sound when compared to pre-spill populations. Boat surveys in the sound show no recovery through 1998.

Harbor seal

Harbor seals in Prince William Sound and the Gulf of Alaska have lost 80 percent of their population over the last 20 years. Originally, the declines may have been related to environmental changes occurring in the late 1970s, but reasons for the continued decline are unknown. The oil spill killed an estimated 300 seals, resulting in a one-year drop of 43 percent in oiled areas compared to a decline of

Resources and Services Injured by the Spill

NOT RECOVERING

Resources are showing little or no clear improvement since spill injuries occurred.

Common loon
 Cormorants (3 spp.)
 Harbor seal
 Harlequin duck
 Killer whale (AB pod)
 Pigeon guillemot

RECOVERY UNKNOWN

Limited data on life history or extent of injury; current research inconclusive or not complete.

Cutthroat trout
 Designated Wilderness Areas
 Dolly Varden
 Kittlitz's murrelet
 Rockfish

RECOVERING

Substantive progress is being made toward recovery objective. The amount of progress and time needed to achieve recovery vary depending on the resource.

Archaeological resources
Black oystercatcher
Clams
 Common murre
 Intertidal communities
Marbled murrelet

Mussels
Pacific herring
 Pink salmon
Sea otter
 Sediments
 Sockeye salmon
 Subtidal communities

RECOVERED

Recovery objectives have been met.

Bald eagle
River otter

Resources in boldface have each moved on this Recovery Line during the most recent update (February 1999)



Photo by Roy Corral

HUMAN SERVICES

Human services which depend on natural resources were also injured by the oil spill. The services below are each categorized as "recovering" until the resources they depend on are fully recovered.

Commercial fishing
 Passive use
 Recreation & tourism
 Subsistence

only 11 percent in adjacent unoiled areas. The decline has continued at an average rate of about 5 percent from 1990-1997.



Harlequin ducks are unable to fly during molt and are easily captured. Research has shown that in recent years female harlequins from oiled areas had a significantly poor winter survival rate when compared to females in unoiled areas.

Photo by Roy Corral

Harlequin duck

Harlequin ducks are struggling in the oiled western portions of Prince William Sound, but are doing fine in other areas never touched by oil.

Harlequin ducks feed in intertidal and shallow subtidal habitats where most of the spilled oil was initially stranded. Three years of data on overwintering adult female harlequins indicate significantly lower survival rates in oiled versus unoiled parts of the sound.

Researchers continue to look at weathered oil remaining on some beaches as a possible reason behind their lack of recovery.

Killer whale

A pod of killer whales, which lost 13 of 36 members in the two years following the oil spill, has yet to regain its former size, even though the overall Gulf of Alaska population is higher than pre-spill numbers. The AB pod lost several adult females and juveniles and it is expected to take many years for natural reproduction to make up for those losses. The pod has increased by three members since 1996. The AB pod has also shown signs of social breakdown within the group, with one matrilineal group leaving to join a different pod. This is a phenomenon never seen before among the matriarchal killer whales.

Pigeon guillemot

Because guillemots feed in shallow, nearshore waters, the guillemots and the fish on which they prey are vulnerable to oil pollution. There is evidence that the pigeon guillemot population in Prince William Sound had declined before the spill and it is estimated that 10-15 percent of the spill-area population may have died following the spill. Boat surveys in the sound show no recovery through 1998.

Chick survival, possibly due to poor quality prey fish, may be a key reason why the pigeon guillemot population has been unable to recover since the spill.

Photo by Natalie Fabes



RECOVERED

At the other end of the recovery scale are **bald eagles** and **river otters**. These species have been declared "recovered" because their populations now appear healthy.

Bald eagle

An estimated 6,000 bald eagles live year-round or seasonally in Prince William Sound. Although an estimated 250 eagles died during the spill, the population rebounded quickly and the bald eagle was formally designated as recovered in 1996.

River otter

River otters feed in intertidal areas making them vulnerable to spilled oil. A low population density and unknown population size in Prince William Sound made it difficult to assess oil spill effects. Studies from 1989-91 identified several differences between river otters in oiled and unoled areas, including evidence of exposure to hydrocarbons or other sources of stress, reduced body size, and increased territory size. River otters were listed as recovered in February 1999 after two years in which such differences largely disappeared.

Facing page: The overall population of resident killer whales in the north Gulf of Alaska has increased to pre-spill numbers, but the often-seen AB pod, which lost 13 members in two years, is just now showing possible signs of recovery.

Photo by Natalie Fabes



RECOVERING

Several resources appear to be making clear progress toward recovery, but have not yet met specific recovery objectives. Only when these objectives are satisfied will they be declared recovered. These include **black oystercatchers, common murres, marbled murrelets, mussels, Pacific herring, pink salmon, sea otters, sockeye salmon, clams, and intertidal and subtidal communities.**

Black oystercatcher

It's estimated that there are only about 15,000 black oystercatchers worldwide, about 10 percent of which summer and nest in Prince William Sound. They spend their entire lives in the intertidal area and are highly vulnerable to spilled oil. In 1998, field studies indicated that oystercatchers have reoccupied and are nesting at oiled sites in Prince William Sound.

Common murre

About three-quarters of all the bird carcasses found after the spill were murres, resulting in declines of as much as 40 percent in local common murre populations. By 1997, common murre colonies had bounced back to near normal conditions.

Though recovery was clearly underway, the year of El Niño brought a setback for the murres. In 1998, carcasses of common murres washed up on shorelines and reproduction was disrupted.

Marbled murrelet

The marbled murrelet is federally listed as a threatened species throughout the Pacific Northwest, but is still relatively abundant in Alaska waters. It is estimated that as much as 7 percent of the marbled murrelet population in the spill area was killed by the spill.

Marbled murrelets declined before the spill, losing 67 percent of their population in Prince William Sound since 1972.

Murrelet numbers rebounded some after the spill and productivity appears to be within normal bounds.

Mussel

Mussels are an important prey species and beds of mussels provide habitat for other organisms in the intertidal zone. To protect these beds, they were not cleaned during the intensive cleanup after the spill. Researchers hand-cleaned 12 mussel beds in 1993 and 1994 as an experiment and will return to those beds in 1999 to determine the long-range success of the effort. Ten years later, oil persists in several mussel beds in Prince William Sound, providing potential pathways of oil contamination for sea otters, river otters, black oystercatchers and harlequin ducks. At least 30 mussel beds in Prince William Sound still contained oil when last sampled in 1995.

Pacific herring

Pacific herring spawned along the shores of Prince William Sound within weeks after the oil spill. Some of these spawning areas were contaminated by oil, resulting in increased egg mortalities and larval deformities. The significance of these initial injuries at a population level is not known.

Pacific herring in Prince William Sound suffered a complete collapse in 1993 due to a fungus and a latent virus that flared into an epidemic. The spawning population went from 113,000 metric tons in 1989 to a low of 16,400 metric tons in 1994. The \$12 million commercial herring fishery in the sound was closed for four successive years, opening again in 1997. In 1998 the population was at more than 38,000 metric tons, and there again was a limited commercial opening.

Ted Spencer of the U.S. Fish and Wildlife Service weighs a pigeon guillemot chick to determine growth rates as part of the APEX project in Prince William Sound.

Photo by L.J. Evans





Pink salmon

Overall, pink salmon are recovering well from the effects of the oil spill. Two primary types of injuries occurred to pink salmon: 1) growth rates were reduced in juveniles from oiled areas, and 2) there was increased egg mortality in oiled streams. Evidence of reduced juvenile growth rates was limited to the 1989 season, but higher egg mortality persisted in oiled-versus-un-oiled streams through 1993 and again in 1997.

There is still concern about egg mortality in some streams in the western part of Prince William Sound. Patches of weathered oil still persist in or near intertidal spawning habitats in a few of the streams used by pink salmon. These patches of oil may be exposed by winter storms and result in new local episodes of pink salmon egg mortality.

Sea otter

It is clear that recovery is underway for sea otters, with the exception of local populations in the most heavily oiled bays on Knight Island. An estimated 100,000 sea otters populate the west coast of North America, including 13,000 in the sound.

Sea otters became the symbol of oil's destruction during the early days of the spill, with an estimated 2,800 animals killed. The lack of recovery in the Knight Island area may reflect the extended time

required for population growth for a long-lived mammal with a low reproductive rate, but it also could reflect the effects of continuing exposure to hydrocarbons or a combination of both factors.

Sockeye salmon

Commercial salmon fishing was closed throughout the spill region in 1989, allowing too many sockeye to enter some rivers. Initially, this produced an overabundance of juvenile sockeye that then overgrazed the zooplankton, thus altering the food webs in the nursery lakes. The result was a decline in growth of juveniles and reduced returns of adults. These effects seem to have largely run their course in the Kenai River system and at Red and Akalura lakes on Kodiak Island, but returns from some of the affected brood years are not all in yet.

Intertidal & subtidal communities

Intertidal and subtidal communities are well on their way to recovery, but recovery is generally incomplete and lagging, especially on shorelines that were both oiled and treated. Subtidal communities include such species as eelgrass, starfish and helmet crabs that remain nearshore but underwater at all times. Intertidal communities include the flora and fauna that live between the low- and high-tide lines, such as clams, *Fucus*, barnacles, and chitons.

Ten river otters forage in the coastal region of Kenai Fjords National Park. River otters were declared "recovered" in February, 1999.

Photo by Roy Corral

RECOVERY UNKNOWN

For some species, not enough is known about their original injury, their current populations, reproductive success, and overall health to make a judgment on their recovery. Studies are underway to learn more about **cutthroat trout**, **Dolly Varden**, **Kittlitz's murrelets**, and **rockfish**.

Cutthroat trout

Prince William Sound is at the northwestern limit of the range of cutthroat trout. Local cutthroat trout populations are believed to be small and geographically isolated. Cutthroat trout, therefore, are highly vulnerable to exploitation, habitat alteration, or pollution. Following the oil spill, cutthroat trout in a small number of oiled streams grew more slowly than in unoiled streams. The apparent difference in growth rates persisted through 1991.

Dolly Varden

Dolly Varden are widely distributed in the spill area. They winter in rivers and lakes, but spend their summers feeding in nearshore marine waters. Dolly Varden had some of the highest hydrocarbon concentrations of any fish studied in 1989. Like the cutthroat trout, there is evidence from 1989-90 that Dolly Varden in a small number of oiled streams in Prince William Sound grew more slowly than in unoiled streams. However, these growth differences did not persist into the 1990-91 winter. No growth data have been gathered since 1991.

Kittlitz's murrelet

Kittlitz's murrelets are found only in Alaska and portions of the Russian Far East. A large fraction of the world population breeds in Prince William Sound. It's estimated that 1,000-2,000 individuals died from the oil spill, which would represent a substantial fraction of the world population.

Because so little is known about this species, the Trustee Council funded an exploratory study on the ecology and distribution of the Kittlitz's murrelet in Prince William Sound starting in 1996. Small population, low reproductive success, and affinity to tidewater glaciers (some of which are receding rapidly) are reasons for concern about the long-term conservation of Kittlitz's murrelet.

Rockfish

Very little is known about rockfish populations in the northern Gulf of Alaska. Some dead adult rockfish were recovered following the oil spill and autopsies indicated oil ingestion as the cause of death. In addition, closures of salmon fisheries apparently increased fishing pressures on rockfish, which may have adversely affected local rockfish populations. However, the original extent of injury and the current recovery status of this species are unknown.

Facing page: A captive sea otter considers its options moments before jumping to freedom. Researchers continue to study why it is taking so long for an abundant sea otter population to recover in the once-oiled areas.

Photo by Roy Corral





Have the people of the spill region fully recovered?

The lives of the people who live, work, and play in the areas affected by the spill were completely disrupted in the spring and summer of 1989. Commercial fishing families did not fish. Those people who traditionally subsist on the fish, wildlife and plants of the region could no longer trust what they were eating and turned instead to high-priced groceries. Recreational opportunities were mostly shut down and the world-wide image of an attractive and pristine Prince William Sound was tarnished with oil.

Ten years later, a sense of normalcy is returning to the spill region, but residents, fishermen, and the tourism/recreation industry have not fully recovered.

The Trustee Council determined that the "human services" of commercial fishing, subsistence, recreation/tourism, and passive use will have recovered when the injured resources on which they depend are once again healthy and productive. Since that level of recovery has not been achieved, each of these services is considered to be recovering.

On a more personal level, it is clear that many people associated with the spill region have not been able to put the trauma behind them. Reasons for this continuing stress vary, but it is widely accepted that one major obstacle to recovery has been the protracted class action lawsuit brought against Exxon. In 1994, a jury awarded the plaintiffs \$5 billion in punitive damages as well as \$287 million for compensatory damages. Nearly five years later, this jury award remains on appeal.

Commercial Fishing

In 1989, fisheries were closed throughout Prince William Sound, Cook Inlet, the outer Kenai coast, Kodiak, and Chignik regions. Disruptions to the fisheries continue to occur in a variety of ways and for a variety of reasons.

- The Pacific herring fishery in Prince William Sound collapsed in 1993 and commercial fishing was canceled for four successive years. Limited fisheries were held in 1997 and 1998.
- Harvest levels of the salmon seine fishery in Prince William Sound have varied widely, but the value of the catch has plummeted after peaking in 1987 and 1988. The earnings of salmon seine

Commercial fishing was idled from Prince William Sound to the Alaska Peninsula in 1989. Sockeye and pink salmon are doing well and herring are improving after the 1993 population crash, so commercial fishing is considered to be recovering.

Photo by Ray Corral



fishermen in the sound have hovered below the 1989 level.

- Prices paid for pink salmon have dropped from 92 cents a pound in 1987-88 to a low of 14 cents a pound in 1997, the lowest price since the early 1980s.
- Salmon seine permits in the sound peaked in value from 1989-1991 but have since declined to roughly 15 percent of their peak value. The number of permits fished, roughly 250 each year from 1981-1991, declined to 114 in 1997.

It is not clear exactly what role the oil spill played or continues to play in the financial woes of the commercial fishing industry. Other factors such as an increase in the world supply of farmed salmon, fisheries management decisions, and changes in processing capacity, also play a major role in the economic changes.

Many projects funded by the Trustee

Council seek to improve the health of commercial fish species and provide the tools for better fisheries management. The excavation of Port Dick Creek and the fish bypass on Little Waterfall Creek on Afognak Island are each examples (*see page 31*) of how restoration projects help to replace lost fishing opportunities. Other projects have fertilized lakes for better salmon production.

The entire seven-year, \$22.4 million SEA project (*see page 27*) is focused on commercial fisheries-related research, especially pink salmon and herring. In addition, another \$23 million has gone to other projects targeting pink salmon, sockeye salmon and Pacific herring. For example, genetic identification of sockeye in the Kenai River (*see page 26*) and genetic mapping of wild pink salmon in Prince William Sound help protect these wild stocks. Since the collapse of the sound's

Subsistence use in the spill region is approaching pre-spill levels in terms of pounds consumed, but poor herring seasons and a dwindling harbor seal population continue to impact the types of foods consumed and the effort involved in harvesting.

Photo by Natalie Fabes



The Alutiq Museum in Kodiak was made possible, in part, by \$1.5 million from the Trustee Council for the region's first archaeological repository.

Photo by Ray Corral

herring fishery, an intensive examination of that species has helped answer many unknowns about the survival needs of herring.

In addition to the benefits from research, the commercial fishing industry will greatly benefit over the long term from the habitat protection program. More than 300 anadromous rivers, streams, and intertidal spawning areas have been protected, helping ensure that future uses of these lands do not harm salmon production.

Subsistence

Fifteen predominantly Alaskan Native communities, totaling about 2,200 residents, are in the oil spill region. Each community relies heavily on harvests of subsistence resources, such as fish, shellfish, seals, deer, and waterfowl. Many families in other communities also rely on the subsistence resources of the spill area.

Household interviews conducted after the spill showed that subsistence harvests in most of the communities declined substantially, primarily due to reduced availability of fish and wildlife, concern about possible health effects from eating oiled foods, and disruption of the tradi-

tional lifestyle due to cleanup and related activities.

In 1998, another round of interviews indicated that subsistence is improving, but has not fully recovered. Fewer people reported a decline in subsistence harvests, and concerns about food safety and effects on the traditional lifestyle have lessened. Subsistence harvests in 1998 varied among communities from 250-500 pounds per person usable weight, indicating continued strong dependence on subsistence resources.

More than 50 percent of subsistence users, however, say that the traditional way of life has not recovered since the spill. They continue to be concerned over a scarcity of some important resources, including harbor seals, herring, clams, and crab. The increase in harvest levels reflects greater harvest effort. In other words, hunters must travel farther and spend more time and money to be successful. The increase also reflects increased reliance on fish in the subsistence diet. For example, Chenega Bay residents indicated a drop in reliance on harbor seals from an average of 140 pounds per person per year before the spill to 15 pounds in 1998. The corresponding levels of salmon usage went from 70 pounds pre-spill to 225 pounds in 1998.

Increased fish consumption is attributable, in part, to enhancement projects funded by the Trustee Council, including the stocking of chinook salmon near Chenega Bay and coho salmon near Tatitlek, stream enhancement efforts near Port Graham, and support of broodstock development at the Port Graham hatchery. In addition, the State of Alaska has used a portion of its funds from the criminal settlement with Exxon to sponsor a sockeye salmon enhancement project near Nanwalek. The Trustee Council's clam project, which is designed to restore clam populations near subsistence communities in lower Cook Inlet

and Prince William Sound, is still in the trial phase. Clams have been planted on select beaches but are not yet available for harvest.

To promote restoration of subsistence services, the Trustee Council has sponsored two Elders-Youth Conferences and production of two documentaries (one on harbor seals and the other on herring) designed to transmit local knowledge and improve overall understanding about the importance of subsistence to the rural communities. The State of Alaska has used a portion of its Exxon criminal settlement funds for "spirit camps" in Prince William Sound and on Kodiak Island.

The Chugach School District is now in its fourth year conducting the Youth Area Watch. This project places students in the field and laboratories to work side by side with scientists conducting oil-spill research. It gives students a greater appreciation of the importance of science in their daily lives and encourages stewardship of the resources on which they depend.

To assist scientists in their efforts to learn why the harbor seal continues to decline, the Alaska Native Harbor Seal Commission and the Alaska Department of

Fish and Game are training subsistence hunters in the proper procedures for taking and storing tissue samples for scientific analysis. This collaborative effort provides a wealth of information about harbor seal locations, diet, and overall health.

Archaeology

In 1993, the Council provided funds for construction of the Alutiiq Archaeological Repository in Kodiak and in 1999 is providing funds for an archaeological repository and local display facilities in the Prince William Sound-lower Cook Inlet region.

Archaeology is considered a resource injured by the spill, but for Native residents, it is an integral part of their culture and lifestyle. The greatest injury to archaeological resources occurred when thousands of cleanup workers were on the beaches and several archaeological sites were vandalized and looted. Other sites were damaged by oil or the subsequent cleanup effort. Monitoring of those sites shows no new signs of vandalism in recent years. Based on the low rate of vandalism and progress in preservation of artifacts and scientific data, archaeological resources are considered to be recovering.



Youth Area Watch, coordinated by the Chugach School District, involves local students with spill-related research. At left, Molly Moore, of Tatitlek, prepares to take biosamples from a harbor seal taken for subsistence. The biosamples are sent to a state laboratory. During a visit to the National Marine Fisheries Service Auke Bay Laboratory (above right) students learn to prepare blue mussels for analysis. Kirsten Smith, of Valdez, tests blue mussels for a naturally-occurring hydrocarbon known as pristane.

Photos by Joshua Hall

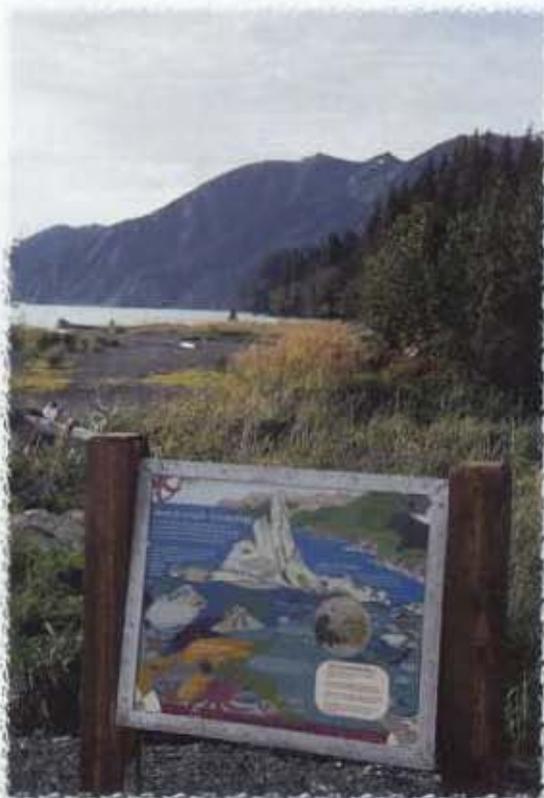


Recreation and Tourism

In the years since the spill, there has been a marked increase in the number of visitors to Alaska — from approximately 600,000 in the summer of 1989 to over 1.1 million in the summer of 1997. The spill area has seen similar increases in tourism. For example, in 1997 the number of visitors to the Kenai Fjords National Park Visitor Center was nearly double what it was in 1989. From 1989 to 1997, the number of sportfishers increased by 65% in Prince William Sound, by 25% in the Kodiak Region, and by 15% in the Kenai Peninsula region.

In spite of the overall increase in tourism, however, the Trustee Council's recovery objective requires that the injured resources important to recreation be recovered and recreational use of oiled beaches not be impaired. This objective has not been met.

Telephone interviews were conducted



in early 1999 with people who recreated extensively in the oil spill area before the spill and currently. Those people familiar with Prince William Sound and the outer Kenai coast continue to report diminished wildlife sightings, particularly in heavily oiled areas. They report seeing significantly fewer seabirds, killer whales, sea lions, seals, and sea otters since the spill, but also reported observing increases in the number of seabirds in the last couple of years. Changes in the amount of wildlife observed could be due to the oil spill or to other factors.

Concern over resources has prompted some fishing restrictions for cutthroat trout and hunting restrictions on harlequin ducks, although not necessarily due to the spill. Some of these restrictions are still in place.

Recreational users surveyed indicated that some beaches in Prince William Sound, particularly in the western portion of the sound, continue to be avoided by kayakers, campers, and other recreational users because of the presence of residual oil. They indicated that the possible presence of residual oil currently has no effect on recreational activities along the outer Kenai coast, the Kodiak Archipelago, and the Lake Clark and Katmai national park coastlines.

Recreational users have benefited greatly from the Trustee Council's large parcel habitat acquisition program, which is opening more than 1,400 miles of shoreline and 300 salmon streams to public use. Several smaller acquisitions

Some parcels acquired through the habitat protection program are being developed for recreational use, such as this popular Lowell Point beach in Seward. The State of Alaska has also dedicated more than \$10 million from the criminal settlement to improve recreational facilities.

Photo by Joe Hurl





*Dr. Sara Iverson talks to a seal pup to keep it distracted while Alaska Dept. of Fish and Game biologist Kathy Frost affixes a satellite transmitter to its back. The transmitter provides information on location, diving depth, and time spent underwater. The transmitter falls off after a few weeks.
Photo by Ray Cornil*

In 1994, the Exxon Valdez Oil Spill Trustee Council set its sights high when it established its mission to restore Prince William Sound and the Gulf of Alaska to the "healthy, productive, world-renowned ecosystem" that existed before the spill. In doing so, the Trustee Council recognized that, in most cases, if protected from harm, injured species will recover on their own. Instead of direct intervention, such as rearing and releasing seabirds, the Trustee Council focused mostly on knowledge and stewardship as the best tools for fostering the long-term health of the marine ecosystem.

Since the Exxon Valdez settlement in

What have we gained through the Research, Monitoring, and General Restoration Program?

1991, hundreds of research, monitoring and general restoration projects have been funded with an investment to date of roughly \$109 million.

A scientific program of this magnitude has resulted in a leap in knowledge about the marine environment on which all Alaskans depend. A better understanding of the ecosystem, along with significant improvements in the tools fish and wildlife managers use to evaluate populations, means better decisions for the health of those populations and the people who depend on them.

Kenai River sockeye salmon genetics

New research into the genetics of sockeye salmon in the Kenai and Russian rivers provides a good example of how increased knowledge translates into better management tools and decision-making.

In 1998, the return of sockeye salmon to the Kenai River was significantly lower than expected. Fisheries managers reduced the sport catch limit on the river and severely restricted commercial fishing. In order to reach minimum escapement goals for key tributaries of the Kenai River, biologists faced a decision about closing the sport fishery altogether. On a Friday, fisheries managers ordered genetic sampling of the sockeye entering the river. By

the following Monday, they had documented that escapement goals to the Russian River would be met and they were able to make a sound decision to keep that popular fishery open. Without the genetic sampling method, developed with funds from the Trustee Council, managers say they would have been forced to close the sport fishery in order to err on the side of caution.

Ecosystem-based research

Trustee Council-sponsored research is providing more information on fish, marine birds, and mammals than ever imagined. These projects benefit commercial and sport fisheries, aquaculture, subsistence, recreation and tourism. Most prominent among them are three ecosystem-scale projects (Fig.1), known primarily by their acronyms: SEA, NVP, and APEX.

The Sound Ecosystem Assessment (SEA) project is the largest project undertaken by the Trustee Council, funded at \$22.4 million over a seven-year period. SEA has dozens of integrated components designed to obtain a clear understanding of the factors that influence productivity of Pacific herring and pink salmon in Prince William Sound. It was conceived in 1993 after the sound suffered a collapse of the herring fishery and erratic returns of wild and hatchery pinks. This project has produced vital information about the survival of juvenile herring and unraveled mysteries showing the effects of wind and ocean currents on plankton, the tiny plants and animals at the very base of the food chain. SEA is providing new insights into ocean currents, nutrients, mixing, salinity and temperatures and how these physical factors influence plant and animal plankton, prey, and predators in the food web.

Fig. 1. The Trustee Council's three main ecosystem-based studies each contribute to an overall understanding of the forces which govern the northern Gulf of Alaska ecosystem. Illustration by Debra Duboc.



The Nearshore Vertebrate Predator (NVP) project is a five-year study of factors limiting recovery of four indicator species using coastal lands and waters. The \$6.4 million project focuses on two fish eaters — river otters and pigeon guillemots — and two species that feed on shellfish and other invertebrates — harlequin ducks and sea otters. Nearshore areas were the hardest hit by the *Exxon Valdez* oil, which clung to beaches and polluted waters on each succeeding tide. When this project was designed, all four predators exhibited signs of stress in oiled areas. These signs have been alleviated for river otters in recent years. Biologists continue to look at oil exposure as a potential factor for the lack of recovery of sea otters, harlequin ducks and pigeon guillemots, but also at such natural factors as food availability.

The Alaska Predator Ecosystem Experiment (APEX) concentrates on the productivity and recovery of seabirds based on the availability of forage fish as

a food source. None of seven seabird species on the injured resources list has recovered. This eight-year, \$9.7 million project looks at wide-ranging ecological changes in an effort to explain why some species, such as pigeon guillemots, aren't recovering.

Accomplishments in restoration

Here are some key findings and accomplishments from the Trustee Council's Research, Monitoring and Restoration Program.

Herring diseases identified

After the collapse of the Prince William Sound herring fishery in 1993, the Trustee Council funded an intensive effort to find the reasons behind the collapse. Scientists identified a fungus and latent virus that suddenly spread throughout the population, perhaps due to oil- or environmentally-related stress. Efforts continue to determine how this ever-present disease affects recov-

Researchers examine Fucus, also called papweed, in 1993, to determine whether this important seaweed was recovering from the impact of the spill and the cleanup. Fucus has not yet returned to pre-spill conditions.

Photo by Nadine Forbes



ery of herring and what factors might trigger an outbreak.

Shift in forage fish documented

Researchers studied a 40-year data set compiled from trawl surveys to analyze the changing makeup of the north Gulf ecosystem. By meshing data sets from two different agencies, researchers identified a major shift in the types of prey available for many common predators. High-fat species, such as capelin, sand lance and eulachon, disappeared around 1978-80 (Fig. 2), while more lean fish, such as flounder, pollock and cod, increased dramatically. This coincided with a two-degree Centigrade increase in the water temperature. The change in the availability of quality forage fish may mean that fewer seabirds and harbor seals reproduce or their young may not survive as well.

Restoration enhances subsistence resources

Several projects are aimed at supplementing subsistence resources for communities. For example, hatchery-produced king salmon are returning to Chenega Bay and similar enhancements are bringing or will bring coho salmon to Tatitlek, Nanwalek, and Perryville. In addition, an experimental effort is underway to spawn and raise littleneck clams and seed them on beaches in Prince William Sound and lower Cook Inlet.

Transient killer whales carry contaminants

Analysis of blubber taken from killer whales has shown that transient whales have contaminant levels more than 10 times higher than those of resident killer whales of Prince William Sound and the Gulf of Alaska. Transients travel throughout the gulf and are known to prey

Documenting the regime shift in the northern Gulf of Alaska

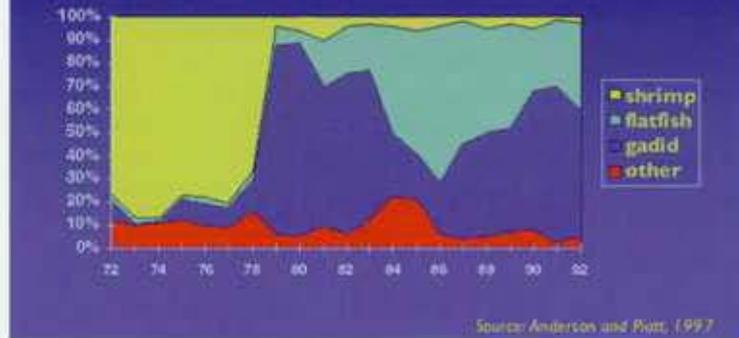


Figure 2. Data from trawl surveys illustrates a sharp change in species composition from 1978-80. Shrimp nearly disappeared as flatfish (such as flounder and halibut) and gadids (such as pollock and cod) began dominating the north Gulf of Alaska.

mostly on marine mammals, while residents usually remain close to home and prey primarily on fish. Calves had especially high levels of contaminants, indicating that contaminants are being passed from mother to offspring. Concentrations of polychlorobiphenyls (PCBs) and DDT derivatives varied depending on age, sex and reproductive status. In addition, researchers have been able to document that transient whales and resident whales are genetically distinct populations.

Solf Lake stocked with sockeye salmon

Researchers determined in 1996 that Solf Lake, above Herring Bay on Knight Island, has the zooplankton biomass to support a population of sockeye salmon. Stocking of this lake began in 1998. This project is designed to benefit subsistence users, particularly the residents of Chenega Bay. Habitat improvements to the lake's outlet were made nearly 20 years ago to provide access for anadromous fish, but the lake itself was not stocked. Based on available spawning area, it's estimated the lake can sustain a run of approximately 10,000 sockeye. A return of about 4,500 sockeye would be required to fully seed the system each year, leaving 5,500 for local harvest.

Sound Ecosystem Assessment

Factors influencing production of pink salmon and Pacific herring

The Sound Ecosystem Assessment (SEA) program was initiated to develop an ecosystem-level understanding of Prince William Sound, particularly as it relates to pink salmon and Pacific herring. Nearly five years later our knowledge of the Prince William Sound ecosystem has advanced dramatically. Central to the production of salmon appear to be the tiny shrimp-like zooplankton that are not only food for young salmon, but also shield them from predation. Understanding this dual role of the zooplankton will allow hatchery operators to optimize their strategies for releasing young salmon.

SEA helped discover that pollock are an important part of the ecosystem, both as predators on juvenile salmon and as food for seabirds. The discovery of dense spawning aggregations of pollock in the sound has led to the development of a new commercial fishery in the oil spill area.

A mathematical model of ocean circulation and productivity developed by SEA can

be used to forecast the strength and location of plankton blooms, providing a basis for improved salmon management in the future. The ocean circulation model may also be used to provide tanker captains with up-to-date knowledge of currents and iceberg movement, which would improve vessel safety and help prevent future oil spills.

SEA established that juvenile herring require sheltered near-shore embayments during the first two years of life, and identified for the first time regions in the sound where these young fish reside. It should now be possible to study the survival of juvenile fish, providing valuable information for sustainable management of the sound's herring fishery.



SEA studies how oceanographic factors influence plankton, the base of the food chain.

Stopping marine pollution at its source

Marine pollution is an additional source of stress that can affect the recovery of injured species. In order to reduce pollutants entering Prince William Sound and the Gulf of Alaska, the Trustees are funding three programs to stop marine pollution at its source.

In Prince William Sound, new "environmental operating stations" are in place in Cordova, Valdez, Tatitlek, Chenega Bay, and Whittier. Similar projects are being developed for Kodiak Island communities and three lower Cook Inlet communities. These waste management programs are designed

to reduce chronic sources of marine pollution by providing facilities and services to properly dispose of used oil, household hazardous waste and scrap metals.

Harbor seal fatty acid analysis

Researchers are now able to determine what a harbor seal eats by looking at its blubber. To develop this method, researchers took blubber samples from seals and compared their fatty acid profiles to those of forage fish. Results indicate that the fatty acids in herring, pollock and other fish are very different from each other and that the differences are detectable in seal blubber.

Analysis of seal blubber from southeast Prince William Sound, for example, showed that seals at Channel Island were eating mostly herring, while seals at Stockdale and Port Chalmers were eating mostly pollock. These areas are only five-to-ten miles apart, yet the seals are apparently eating different prey. Fatty acid analysis has become an essential tool in research to determine why harbor seals in Prince William Sound continue to decline.

Little Waterfall Creek enhancements

To boost the numbers of pink and coho salmon in Kodiak-area waters, the Trustee Council funded improvements to a bypass at Little Waterfall Creek. By upgrading the bypass, more salmon will be able to reach spawning habitat in the upper portions of the creek. Within two years after completion of the project, the number of salmon using the bypass tripled from 20 percent to 59 percent of the run.

Winter survival of harlequin ducks down

After banding or placing transmitters on more than 700 harlequin ducks, researchers were able to determine that winter survival for adult females differed significantly when comparing oiled to unoiled areas in Prince William Sound. Research during the winter of 1995-96 showed that 94 percent of the females in unoiled areas survived compared to 77 percent survival in oiled areas. Over time, in the absence of immigration, this could result in significant reduction of harlequin ducks in the western sound. Research is continuing to determine whether contrasting survival rates could be due to local differences such as habitat, available food, predation or exposure to oil.

SeaLife Center mixes research, education

The Alaska SeaLife Center opened its doors May 2, 1998, the culmination of a 30-year dream for the people of Seward. This \$55 million facility combines three main

missions. It provides public education about the marine environment, maintains the best marine research facilities in the north Pacific, and offers animal rehabilitation for injured marine mammals and seabirds. Visitors not only view fish, seabirds, and marine mammals in natural-looking environments, but also get to watch scientists conducting hands-on research. The Trustee Council provided \$26.2 million for the research portions of the facility.

Weathered oil remains potent for fish

Oil that has weathered for 10 years can still be a threat, researchers with the National Marine Fisheries Service discovered. In laboratory conditions, researchers were surprised to learn that weathered oil continues to cause damage to salmon eggs in amounts less than 4 parts per billion, which equals the existing state water quality standard. Damage to herring eggs was documented at similarly low levels. This information is now available for consideration in the agency permitting process when developments are proposed near salmon or herring spawning areas.

The resurrection of Port Dick Creek

Port Dick Creek, on the southern coast of the Kenai Peninsula, once provided a healthy surplus of chum and pink salmon for the commercial fishing fleet. But five minutes of shaking during the 1964 earthquake filled the spawning areas of two tributaries with debris and severely diminished its capacity to produce salmon. Later these same streams were contaminated with *Exxon Valdez* oil.

In 1996, biologists with the Alaska Department of Fish and Game barged heavy equipment to the site, excavated the old creek beds, and returned the creek, as close as possible, to its pre-earthquake condition. A harvestable surplus of chums is now projected from Port Dick Creek beginning in the year 2000.



Does oil remain on the beaches 10 years later?

There is still oil to be found in certain parts of the spill area. Some of the oil is hidden just beneath the surface while some is exposed and turned to asphalt. This photo was taken in western Prince William Sound in 1997.

Photo by Ray Canal

The western portion of Prince William Sound was the most heavily oiled in 1989 and in several locations oil remains on the surface or just beneath the surface 10 years later. Oil on some beaches remains a serious concern for residents of Prince William Sound who traditionally use these areas for hunting, fishing and gathering. Subsistence activities continue for residents of the sound, but generally they no longer use beaches that contain oil. Recreational users such as campers and kayakers also usually avoid these areas.

Exxon Valdez oil penetrated deeply into cobble and boulder beaches that are common on shorelines throughout the spill area, especially in sheltered habitats that don't receive much winter storm action. Cleaning and natural degradation removed much of the oil from the intertidal zone, but visually identifiable surface and subsurface oil persists at many locations.

A 1989-90 survey of nearly 5,000 miles of shoreline documented oil on approximately 1,300 miles of beach. The oiling was considered heavy or medium on 200 miles of shoreline. The remaining 1,100 miles of oiled shoreline were considered to have light or very light oiling. When crews returned to the beaches in 1993, they found hundreds of sites that contained substantial oil deposits.

What happened to the 10.8 million gallons of oil released into the environment? A 1992 National Oceanic and Atmospheric Administration study (Fig. 3) provided some insight, estimating that the great majority of the oil either evaporated, dispersed into the water column or degraded naturally. Cleanup crews recovered about 14 percent of the oil and approximately 13 percent sunk to the sea floor. About 2 percent (some 216,000 gallons) remained on the beaches.

In 1997, eight years after the oil spill, villagers from Chenega Bay returned to nearby beaches to clean some of the most heavily-oiled sites. Under the guidance of the Alaska Department of Environmental Conservation, the crew of mostly-local residents applied a chemical agent to the weathered oil at five sites, along about one-half mile of beach on LaTouche and Evans islands. They used PES-51, a citrus-based product from the oil of oranges and lemons. PES-51 binds to the oil and floats, allowing both the chemical agent and the oil to be collected through the use of oil-absorbent pads.

One year later, preliminary analysis of targeted sites showed that the cleanup method was largely effective in removing the visible surface oil. But it had little effect on the large deposits of oil beneath rocks

and overburden. Winter storms rearranged the beaches, exposing large quantities of oil that never received treatment. NOAA's Auke Bay Lab found no biological injury due to the cleanup.

Oil remains in mussel beds in at least 30 sites in Prince William Sound. An experimental effort to clean mussel beds by hand was conducted in 1993. Researchers will return to those sites in 1999 to determine the success of that project.

The coasts of the outer Kenai and Alaska peninsulas get more wave action than most shorelines within Prince William Sound. These Gulf of Alaska sites tended to be contaminated with oil in the form of mousse, which can persist for long periods in a largely unweathered state. These oiled beaches were last visited in 1994, but researchers will return during the summer of 1999 to monitor their condition.

In 1995, a shoreline survey team visited 30 sites in the Kodiak Archipelago that had measurable or reported oiling in 1990 and 1991. The survey team found no oil or only trace amounts at these sites. The oiling in the Kodiak area did not persist as it has at sites in Prince William Sound due to the higher energy settings in the Kodiak area and the smaller concentrations of initial oiling relative to the sound.



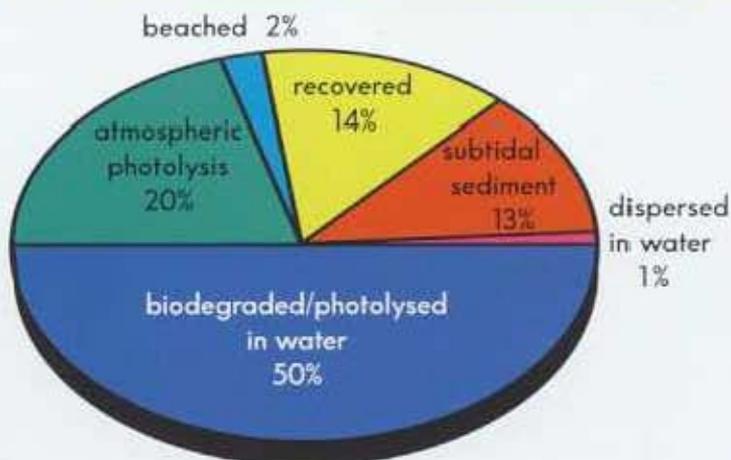
A member of a 1997 cleanup crew mops up oily sheen as it washes to the water's edge. The \$1.9 million cleanup effort covered about one-half linear mile of shoreline and had mixed results.

Photo by Roy Corral

Fate of the spilled Exxon Valdez oil

Figure 3: An estimated 2 percent of the spilled oil remained on beaches in 1992, according to a NOAA study. Another 13 percent had sunk and remained in subtidal sediments.

Source: Wolfe, D.A., et al. 1998. The fate of the oil spilled from the Exxon Valdez. *Environmental Science and Technology* 28:561A-568A.





What habitat has been protected?

How does habitat protection help injured species recover?

Restoration efforts in the Pacific Northwest have taught us that habitat protection is essential to the health of salmon species. Researchers have concluded that "depleted salmon populations cannot rebuild if any habitat that is critical during any of the life stages is seriously compromised." This lesson extends, as well, to other fish, birds, and mammals injured by the oil spill.

Salmon, for example, spend the first part of their lives foraging in lakes and rivers before migrating out to sea. These small fry, inches long, are highly dependent on riverbank vegetation to slow down the fast-moving current and provide cover from predators. Degradation of that essential habitat can have far-reaching consequences.

Marbled murrelets, a small seabird that nests in the moss of old-growth forests, are designated as threatened throughout the west coast of the United States and Canada. Alaska is their last stronghold, but their numbers in Prince William Sound have declined by two-thirds over the last

20 years. Preservation of old-growth maritime forests is an important part of the effort to keep these seabirds off the endangered species list.

Black oystercatchers nest on rocky shorelines and are sensitive to any human activity. They have a world-wide population estimated at only 11,000, about half of which are in Alaska. The Trustee Council's habitat protection program has protected 1,400-plus miles of shoreline, much of it good nesting habitat for the black oystercatcher.

Many species injured by the oil spill nest, feed, molt, winter, and seek shelter in the habitat protected through the Trustee Council's large and small parcel programs. Several other species live primarily in the nearshore environment and benefit from the protection of the nearby uplands.

Habitat protection also supports the restoration of tourism, recreation, commercial fishing and subsistence, all of which are dependent upon healthy productive ecosystems.

Using settlement funds, the Trustee Council is working to protect about 650,000 acres important for restoration.



Paul's Lake on northern Afognak Island is part of a package that protects 45,000 acres of old-growth forest. This region was ranked highest in the spill region for its value to injured resources.

Photo by Roy Corral

Facing page: Jackpot Bay is considered the most important habitat in Prince William Sound for the recovery of injured species. This bay, acquired and protected in 1997, is increasingly being discovered by recreational users for its fishing, wildlife and tranquility.
Photo by Richard Larson

This includes more than 300 streams valuable for salmon spawning and rearing.

Protecting habitat as a restoration tool received the greatest support from among the 2,000 people who attended public meetings and commented on the Restoration Plan in 1993-94. About 90 percent of respondents said they would like to see some type of habitat protection program. When asked how much of the settlement funds should be dedicated to habitat, people living within the spill area responded with an average of 60 percent. To date, the Trustee Council has allocated \$395.3 million for habitat, a little more than half of the funds available for restoration.

Large Parcel Program

The Trustees established two habitat protection programs, both of which work only with willing sellers. The Large Parcel Program protects blocks of land in excess of 1,000 acres.

Most owners of large parcels in the spill region are Native corporations. The Alaska Native Claims Settlement Act of 1971 provided for Native villages to select 44 million acres of public lands in Alaska and set up corporations to manage those

lands and provide economic benefits for their Native shareholders. Lands were selected for proximity to villages, historical uses, and future development opportunities. Large blocks of land were selected, including some of the finest timber tracts, most productive estuaries and bays, and valuable salmon streams. These lands provide critical habitat for many of the fish and wildlife resources injured by the 1989 oil spill.

Negotiations with landowners have resulted in creative habitat protection measures, including fee-simple purchases, conservation easements, timber easements, and retention of shareholder home sites. The Trustee Council works only with willing sellers to craft protection packages that provide the highest benefit for the resources, Native shareholders, and the public. Most agreements allow public access for camping, hunting and fishing, restrict development, and maintain subsistence uses, while protecting injured resources and providing economic benefits to Native corporations. To date, the habitat protection agreements have been strongly supported by Native shareholders. In most cases, shareholders were required to approve the agreements by a two-thirds vote or better. Shareholder approval has ranged from 81 to 88 percent.

Prince William Sound

Prince William Sound, where spilled oil did its greatest damage, is also home to five of the seven most valuable parcels in terms of restoration value. Each available parcel in the spill region was ranked for its value as habitat for injured resources.

Jackpot and Eshamy bays in western Prince William Sound, Bligh Island and Two Moon Bay in the northeastern sound, and Sheep Bay in the eastern sound are all regarded as having exceptionally valuable habitat. Logging was already underway at

The Trustee Council acquired 30,000 acres of private inholdings within Kenai Fjords National Park in 1997. Another 2,000 acres were protected on nearby islands as part of the Alaska Maritime National Wildlife Refuge. Photo by Roy Corral



Habitat Protection Large Parcel Program

| Parcel Description | Acreage | Coastal Miles ⁵ | Salmon Rivers ⁶ | Total Price | Trustee Council's Share |
|------------------------------------|----------------|----------------------------|----------------------------|----------------------|-------------------------|
| Acquisitions Complete | | | | | |
| Afognak Joint Venture | 41,750 | 99 | 18 | \$74,133,824 | \$74,133,824 |
| Akhiok-Kaguyak | 115,973 | 202 | 39 | \$46,000,000 | \$36,000,000 |
| Chenega | 59,520 | 190 | 45 | \$34,000,000 | \$24,000,000 |
| English Bay ¹ | 32,537 | 123 | 31 | \$15,371,420 | \$14,128,074 |
| Eyak ² | 75,425 | 189 | 80 | \$45,100,000 | \$45,100,000 |
| Kachemak Bay State Park inholdings | 23,800 | 37 | 3 | \$22,000,000 | \$7,500,000 |
| Koniag (fee title) | 59,674 | 41 | 11 | \$26,500,000 | \$19,500,000 |
| Koniag (limited easement) | 55,402 | | | \$2,000,000 | \$2,000,000 |
| Old Harbor ³ | 31,609 | 183 | 13 | \$14,500,000 | \$11,250,000 |
| Orca Narrows (timber rights) | 2,052 | | 2 | \$3,450,000 | \$3,450,000 |
| Seal Bay/Tonk Cape | 41,549 | 112 | 5 | \$39,549,333 | \$39,549,333 |
| Shuyak Island | 26,665 | 31 | 8 | \$42,000,000 | \$42,000,000 |
| Tatitlek | 69,814 | 212 | 50 | \$34,550,000 | \$24,550,000 |
| TOTAL: | 635,770 | 1,419 | 305 | \$399,324,038 | \$342,580,691 |

Negotiations Continuing

Koniag (fee title)⁴

1. 2,901 acres of English Bay package still waiting to close.
2. Approximate acreage. Closing completed but transfer pending approval by shareholders on parts of the package.
3. As part of the protection package, the Old Harbor Native Corporation agreed to protect an additional 65,000 acres on Sitkalidak Island as a private refuge.
4. Negotiations with Koniag concern fee title to the 55,402 acres that are currently protected under a temporary conservation easement due to expire in December 2001.
5. Approximate miles of coastline.
6. Approximate number of anadromous rivers, streams and spawning areas.

Two Moon Bay when habitat protection efforts began and other areas were slated for timber harvest.

Under agreements with Chenega Corporation, Tatitlek Corporation, and Eyak Corporation, 204,759 acres were protected, including nearly 600 miles of shoreline and 175 salmon streams. About 40 percent of the total acreage is protected through conservation and timber easements. Chugach National Forest has taken over management of most of the land, with smaller areas set aside for the state to manage as part of the marine park system.

Lower Kenai Peninsula

Two protection packages that received overwhelming public support are located on the Kenai Peninsula. The first occurred in 1993, when the state acquired 23,000 acres within popular Kachemak Bay State Park, across the bay from Homer, to prevent logging of the old-growth maritime forest. The Trustee Council provided \$7.5 million for the purchase, and the State of Alaska contributed \$7 million from the Exxon criminal settlement and another \$7.5 million from its civil settlement with Alyeska Pipeline Service Company.

In 1997, the Trustees funded the purchase of 32,537 acres within Kenai Fjords National Park and adjacent islands within the Alaska Maritime National Wildlife Refuge. The \$14.1 million land package with English Bay Corporation includes some of the most valuable coastal habitat within the park, which is the second most popular park in Alaska, behind Denali National Park and Preserve.

Afognak-Shuyak Islands

Shuyak Island State Park quadrupled in size in 1997 when 26,665 acres protected by the Trustee Council were added to the park along with other state lands. The habitat on Shuyak Island was ranked among the highest in the spill region and is very popular for recreational purposes.

Afognak Island State Park was created in 1994 after protection of 41,549 acres

through the Trustee Council process. This highly productive coastal habitat was threatened by imminent clearcut logging of the mature spruce forest.

Another 41,350 acres were protected on northern Afognak Island, adjacent to the Kodiak National Wildlife Refuge and Afognak Island State Park. This \$70.5 million agreement protects the most highly ranked habitat in the spill region, including large buffers around the popular Paul's and Laura lakes. The extremely high economic value of the timber resources on Afognak Island make protection of this area the most costly in the spill region. Ironically, the trees valued as good marbled murrelet nesting habitat are also those most highly valued for timber.

Kodiak Island

The protection of habitat on Kodiak Island includes the high value land around Olga Bay and the very popular salmon systems of the Karluk and Sturgeon rivers. The Trustees have protected 262,658 acres on the island, all of it within Kodiak National Wildlife Refuge. In addition to providing protection for pink and sockeye salmon, harlequin ducks, bald eagles, black oystercatchers, and other injured



Clearcuts to old-growth forests decreased essential habitat for marbled murrelets, which nest up to 40 kilometers inland, but feed in saltwater.

Photo by Natalie Fabes

| Habitat Rankings | | Bald Eagle |
|------------------------------------|-----------------------------------|------------|
| H High | 1. Paul's & Laura Lakes - Afognak | H |
| M Moderate | 2. Sheep Bay - PWS | H |
| L Low | 3. Jackpot Bay - PWS | M |
| - Species does not inhabit area | 4. Two Moon Bay - PWS | H |
| | 5. Bligh Island - PWS | H |
| | 6. Olga Bay - Kodiak | H |
| | 7. Eshamy Bay - PWS | H |
| | 8. Shuyak Strait - Afognak | M |
| | 9. Alulik Peninsula - Kodiak | M |
| | 10. Windy & Deep Bays - PWS | H |
| | 11. Shuyak Island | L |
| | 12. Upper Station - Kodiak | H |



resources, the Kodiak Island acquisitions also help protect habitat important to Kodiak brown bears.

Olga Bay, Upper Station lakes, and the Aiulik Peninsula on the southern tip of the island are all considered among the most valuable habitats for injured species.

The Karluk and Sturgeon rivers, among the most productive salmon systems in Alaska, were given temporary protection through a limited-term easement that expires in 2001. Negotiations continue with Koniag Corporation to make the protection package permanent.

Small Parcel Program

The Small Parcel Program recognizes the special qualities and strategic value of smaller tracts of land. Small parcels are typically located on coves, along important stretches of river, at the mouths of rivers, adjacent to valuable tidelands, and, often, close to spill-area communities. These properties are acquired for their habitat qualities as well as for their importance for recreational and subsistence use.

Parcels must be nominated by the landowner on a voluntary basis. Of the 300 small parcels that have been nomi-

More than 1,400 miles of shoreline have been protected, including haulout areas for harbor seals, the mouths of more than 300 salmon streams and nesting and foraging habitat for black oystercatchers (inset).

*Photo by Roy Cornell
Inset photo by Natalie Faber*

| | Pink Salmon | Dolly Varden | Cutthroat Trout | Pacific Herring | Bl. Oystercatcher | Common Murre | Harbor Seal | Harlequin Duck | Intertidal Subtidal | Marbled Murrelet | Pigeon Guillemot | River Otter | Sea Otter |
|--|-------------|--------------|-----------------|-----------------|-------------------|--------------|-------------|----------------|---------------------|------------------|------------------|-------------|-----------|
| | H | L | - | M | H | L | H | H | H | H | H | M | H |
| | H | M | L | M | H | L | H | H | H | M | L | M | H |
| | H | H | M | L | L | L | M | H | M | M | H | M | M |
| | H | H | H | H | H | L | H | L | H | M | M | H | H |
| | L | L | L | H | H | L | M | H | H | M | H | H | M |
| | H | H | - | H | L | L | H | H | H | M | H | H | H |
| | M | H | H | L | M | L | M | M | M | M | L | H | M |
| | H | H | - | H | H | L | H | H | H | H | H | M | H |
| | H | H | - | M | H | H | H | H | H | H | H | H | L |
| | H | M | H | M | M | L | M | L | M | M | L | M | H |
| | M | H | - | M | M | L | M | M | H | M | H | H | H |
| | L | H | - | H | M | L | H | M | L | L | L | H | L |

In 1993, a team of biologists evaluated large parcels being considered for protection. The lands were evaluated, in part, for the importance of habitat for species as well as archaeology, subsistence, recreation, and commercial fishing. The top 12 parcels are shown here along with the habitat ranking value for each species.



Lake Clark National Park

Cook Inlet

Kenai

Sold

Kenai
Wildlife

KENAI PENINSULA

Homer

Kachemak Bay
State Pk

Kenai Fjords

Seldovia

Port Graham

Nanwalek

Katmai National Park

BARREN ISLANDS

SHUYAK ISLAND

Shuyak Island St. Park

Afognak Island St. Park

ALASKA PENINSULA

AFOGNAK ISLAND

Port Lions

Ouzinkie

Kodiak

Larsen Bay

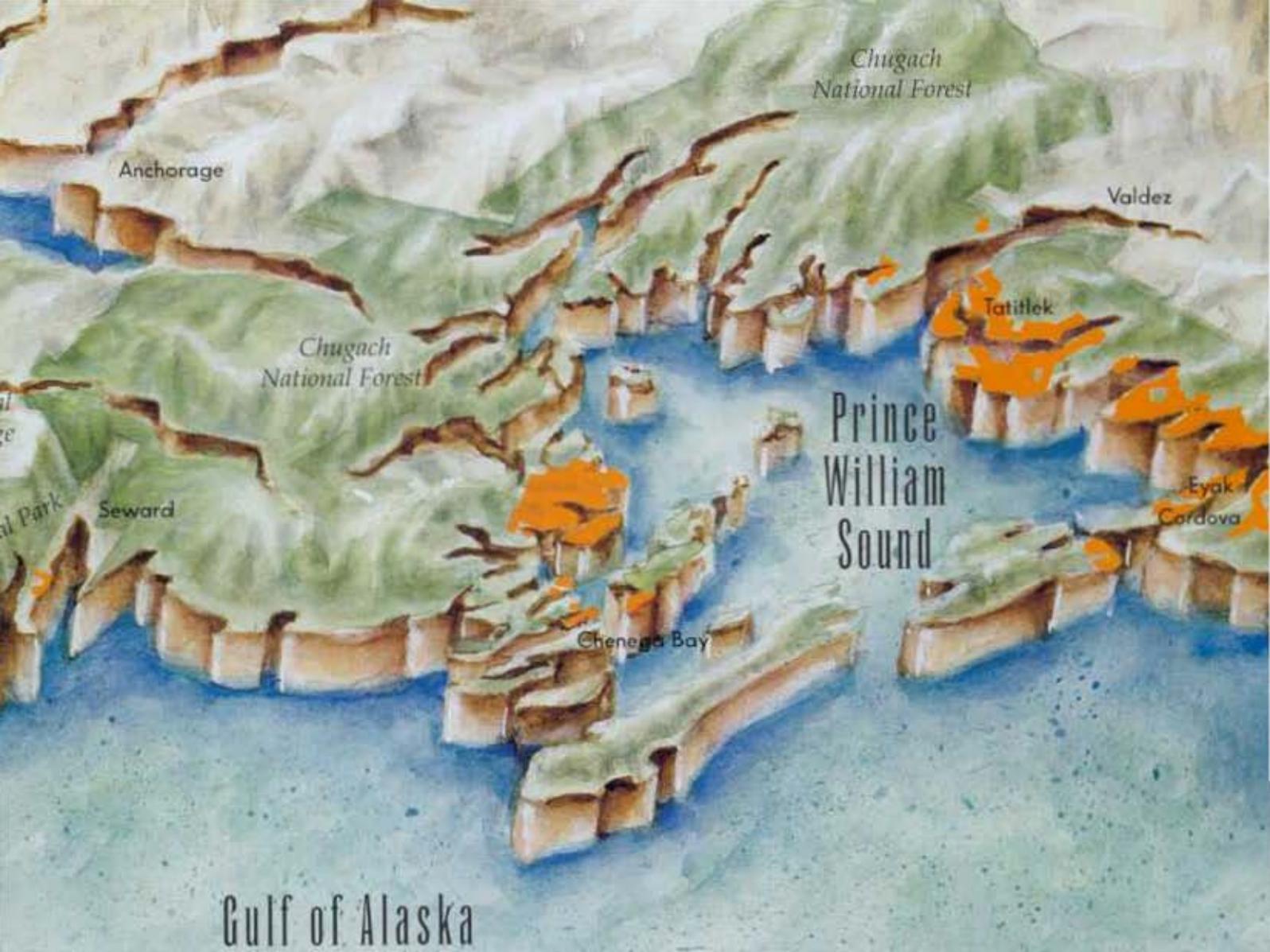
Kodiak National
Wildlife Refuge

Karluk

Old Harbor

KODIAK ISLAND

Akhiak



Large Parcel Habitat Protection

Map by Debra Dittus



Habitat protected through acquisition of title, conservation easements, or timber easements



State or Federal land designations





Habitat protection efforts on the Kenai River have protected about eight miles of riverbank, providing new public access. In addition, millions of dollars have been invested to restore trampled riverbank and protect heavily-used areas from further degradation. Photos by Robert Angell.

nated for the program, about 20 percent have qualified for consideration.

As of January 1, 1999, the Trustee Council has completed acquisition of or has offers pending on 45 parcels totaling 8,257 acres for a total investment of \$21.7 million.

Kenai Peninsula

Protection of the Kenai River has been a primary focus of this program. Altogether, the Trustee Council has protected or made offers to protect 1,758 acres along the Kenai River and its watershed, including several miles of shoreline. Another 2,454 acres have been protected along the Moose River, a major sockeye salmon producer that feeds into the Kenai River.

Some of the Kenai River parcels will be developed to provide appropriate access to the river, including parking, sanitation, and light-penetrating "gratewalks" to protect the riverbank vegetation from getting trampled during the sport fishing season. This provides access while allowing other public areas to recover from impacts of overuse. In addition, the Trustee Council has provided nearly \$2 million to restore riverbank habitat that was degraded from trampling.

The Homer area has benefited from several prominent acquisitions, including a 220-acre site on bluffs overlooking Cook

Inlet with beach access. A 97-acre tract known as Overlook Park, with good tidal pools and spectacular views of Kachemak Bay and the Homer Spit, was also acquired and protected from development. An effort to protect key tidal and wetland habitats at the base of the Homer Spit and on nearby Beluga Slough was completed in 1998. The protected lands on the Homer Spit are enjoyed by thousands of people each year during the Kachemak Bay Shorebird Festival.

Kodiak Archipelago

The Trustee Council has protected 12 parcels totaling 975 acres in the Kiliuda Bay, Uyak Bay, and Sitkalidak Strait regions of southern Kodiak Island.

In March of 1998, an offer was made to acquire 1,028 acres known as Termination Point, a popular recreation area at the western terminus of the Kodiak road system. The \$1.86 million offer is pending. Acquisition of Termination Point has overwhelming support from the local community.

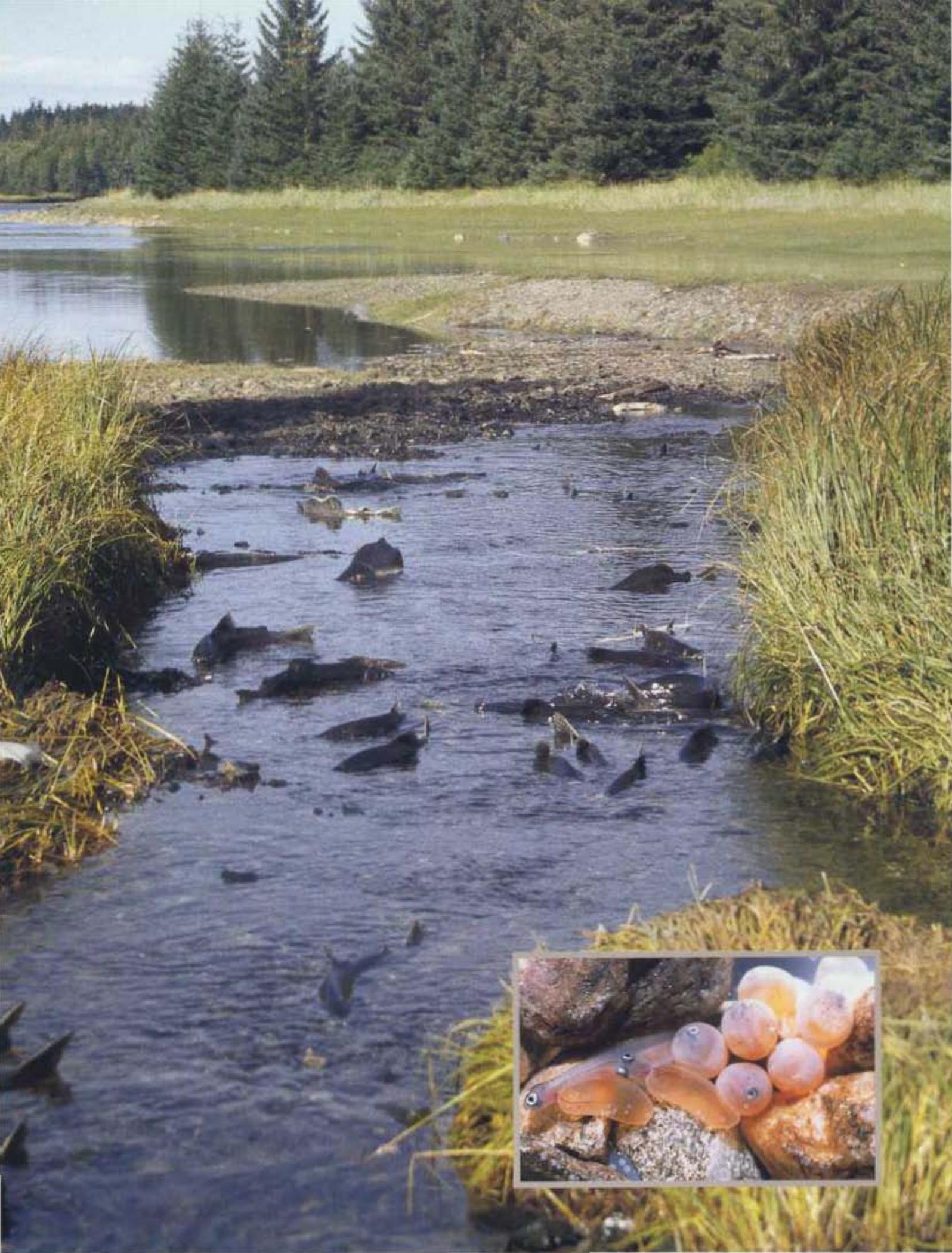
Prince William Sound

A 315-acre site within Horseshoe Bay State Marine Park on LaTouche Island was protected as part of the small parcel Program in Prince William Sound. Five parcels at Ellamar near Tatitlek and one site adjacent to the Valdez Duck Flats were also acquired.

Three additional sites at the Valdez Duck Flats and a 942-acre parcel at Jack Bay are currently under consideration for protection.

Facing page: The Trustee Council habitat programs have protected more than 300 salmon streams, many of them intertidal, such as this one at Canoe Passage in western Prince William Sound. Pink salmon eggs in intertidal streams are vulnerable to oil spills and other disruptions.

*Photo by Kevin Harwell
Inset Photo courtesy Alaska Dept. of Fish & Game*





An oiled bald eagle sits in a cage awaiting its turn to be cleaned, 1989.

Photo by Natalie Fabies

The Trustee Council is funding a balanced restoration effort that will continue long after the last check from Exxon arrives in September 2001.

Two funds are being set up, providing income for a long-term habitat protection program and a multi-decadal research and community-based restoration program.

The original 1994 restoration plan called for the Trustee Council to create a reserve account to fund restoration into the future. By setting aside \$12 million annually in an interest-bearing account, the Trustees were able to ensure a \$140 million reserve. An additional \$30 million is expected to be added to the reserve using unspent funds.

After 18 months of public comment and meetings throughout Alaska, it was clear that the public strongly supported continuation of the Council's two main restoration programs. Trustees decided March 1, 1999 to place \$55 million into a long-term habitat protection program and approximately \$115 million to fund a research, monitoring and general restoration program.

With this decision, the Trustees will have dedicated in total about 60 percent of available funds or \$432 million for habitat protection in the spill region. The program is thus far responsible for acquiring title, conservation easements, or timber easements on about 650,000 acres, including

What about the future of restoration?

more than 300 salmon streams and 1,400 miles of shoreline.

The remaining 40 percent, or \$285 million, has funded one of the largest marine science efforts in the world, including hundreds of studies to better understand the dynamics of the ecosystem as a whole, as well as the roles played by individual fish and wildlife species.

The Trustees emphasized that a balanced approach is necessary for the long-term health of injured fish, wildlife, and other species. Permanent protection of upland habitat is one vital component. The species injured by the spill, however, spend most or all of their lives at sea. Since the sea cannot be protected through acquisition, the best long-term protection is increased knowledge and better tools to support sound management decisions.

The research and restoration fund will start with about \$115 million. Earnings from investment of the fund (at the nominal interest rate of 5 percent per year) will provide about \$6 million annually to fund a long-term restoration effort.

In addition to research, the fund will promote development of better tools and methods for fish and wildlife management, as well as support community-based projects, including enhancements to subsistence, educational programs, local stewardship of

resources, and other projects that have been an ongoing part of the current restoration program.

The funding for habitat protection will be flexible enough to be used for a large protection effort on Kodiak Island or elsewhere in the spill region and for protection of key small parcels that are usually located at the mouths of rivers, along salmon spawning and rearing areas, or important coastal areas. The fund is expected to be worth \$55 million.

At the rate of 5 percent annual interest, the habitat fund earnings could provide about \$2.6 million each year for small parcels. The Trustees could choose, however, to spend the principal on larger protection packages.

The Council's action is based on existing authority and assumes that interest earnings would continue to be approximately 5 percent. The Council has sought Congressional help to expand its investment authority, but has so far been unsuccessful.

Details on how the funds will be established and managed have not yet been worked out. The Trustee Council also has other key issues to decide in the future. Trustees must determine whether to continue supporting the large public involvement process, including the Public Advisory Group, with its associated expenses, or to have a reduced effort. They must also decide whether the Trustee Council should continue to exist as managers of the programs or whether a different oversight entity should be established.



Twice in recent years the Trustee Council has sponsored gatherings of village youth and elders to discuss ongoing research and continuing impacts to wildlife and other concerns about the oil spill. Traditional dances by the Nanwalek Seal Dancers, Kodiak Alutiq Dancers, and Tatillek Alutiq Dancers were an important part of a gathering in Cordova in August 1998.

Photo by Susan Harding



What's being done to prevent another spill?

If another spill occurs, can it be cleaned up?

The U.S. Coast Guard now follows the movements of oil-laden tankers until they leave Prince William Sound.

Photo by Natalie Fisher

One of the major lessons of the *Exxon Valdez* oil spill was that the spill prevention and response capability in Prince William Sound was fundamentally inadequate.

Ten years ago, 11 million gallons of oil spread slowly over open water during three days of flat calm seas. Despite the opportunity to skim the oil before it hit the shorelines, almost none was scooped up. A response barge maintained by Alyeska Pipeline Service Company was out of service and unavailable for use. Even if it had responded, there were not enough skimmers and boom available to do an effective job.

Dispersants were applied, but were determined to be ineffective because of prevailing conditions. Even if dispersants had been effective, however, there was not enough dispersant on hand to make a dent in the spreading oil slick.

Since that time, several significant improvements have been made in oil spill prevention and response planning.

- The U.S. Coast Guard now monitors fully laden tankers via satellite as they pass through Valdez Narrows, cruise by Bligh Island, and exit Prince William Sound at Hinchinbrook Entrance. In 1989, the Coast Guard watched the

tankers only through Valdez Narrows and Valdez Arm.

- Two escort vessels accompany each tanker while passing through the entire sound. They not only watch over the tankers, but are capable of assisting them in the event of an emergency, such as a loss of power or loss of rudder control. Ten years ago, there was only one escort vessel through Valdez Narrows.
- Specially trained marine pilots, with considerable experience in Prince William Sound, are now aboard the ship during its entire voyage through the Sound. Weather criteria for safe navigation are firmly established.
- Congress enacted legislation requiring that all tankers in Prince William Sound be double-hulled by the year 2015. It is estimated that if the *Exxon Valdez* had had a double-hull structure, the amount of the spill would have been reduced by more than half. There are presently three double-hulled and twelve double-bottomed tankers moving oil through Prince William Sound. Arco Marine is constructing two new double-hulled tankers, the first of which is expected to be in use in 2000.

- Contingency planning for oil spills in Prince William Sound must now include a scenario for a spill of 12.6 million gallons. Drills are held in the sound each year.
- The combined ability of skimming systems to remove oil from the water is now 10 times greater than it was in 1989, with equipment in place capable of recovering over 300,000 barrels of oil in 72 hours.
- Even if oil could have been skimmed up in 1989, there was no place to put the oil-water mix. Today, seven barges are available with a capacity to hold 818,000 barrels of recovered oil.
- There are now 34 miles of containment boom in Prince William Sound, seven times the amount available at the time of the *Exxon Valdez* spill.
- Dispersants are now stockpiled for use and systems are in place to apply them from helicopters, airplanes, and boats.

The debate continues to rage over whether a spill the size of the *Exxon Valdez* disaster can be contained and removed once it's on the water. But there is little doubt that today the ability of industry and government to respond is considerably strengthened from 10 years ago.

Complacency is still considered one of the greatest threats to oil spill prevention and response. To help combat that threat the Alaska Department of Environmental Conservation (ADEC) conducts both scheduled and unannounced drills and participates in regular training exercises in Prince William Sound each year. Community training programs have been established and local fishing fleets have been trained to respond to spill emergencies.

In addition, the Prince William Sound Regional Citizens' Advisory Council, established by an act of Congress, serves as a citizen watchdog over the Alyeska Terminal, the shipping of oil through the sound, and the government agencies that regulate the industry. A similar citizen's organization watches over oil issues in Cook Inlet.



Exhausted and heavily-oiled cleanup workers take a break at the end of their shift. The cleanup included about 10,000 workers, 1,000 boats and 100 airplanes and helicopters, known as Exxon's army, navy and air force. 1989.

Photo by Natashe Faber

Exxon Valdez Oil Spill Trustee Council



Trustees met March 1, 1999, to establish programs for long-term restoration. In the back row are Frank Rue, commissioner, Alaska Dept. of Fish & Game; Craig Tillery, Alaska Department of law representative; Dave Gibbons, U.S. Forest Service representative, Alaska Region, U.S. Dept. of Agriculture; and Trustee Council Executive Director Molly McCammon. Sitting in the front row are Michele Brown, commissioner, Alaska Dept. of Environmental Conservation; Steve Pennoyer, director, Alaska Region National Marine Fisheries Service; and Marilyn Heiman, assistant to the Secretary for Alaska, US Dept. of the Interior. Photo by Michael Dineen.



The Public Advisory Groups met in joint session with the Trustee Council January 20 to discuss possible uses for the Restoration Reserve.

Photo by Roy Canal

Public Advisory Group

| | |
|------------------------|-------------------------|
| Rupert Andrews (chair) | Sport Hunting & Fishing |
| Torie Baker | Commercial Fishing |
| Chris Beck | Public at Large |
| Pamela Brodie | Environmental |
| Sheri Burette | Subsistence |
| Dave Cobb | Public at Large |
| Chip Dennerlein | Conservation |
| Eleanor Huffines | Commercial Tourism |
| Dan Hull | Public at Large |
| James King | Public at Large |
| Mary McBurney | Aquaculture |
| Charles Meacham | Science/Academic |
| Brenda Schwantes | Public at Large |
| Stacy Studebaker | Recreational Users |
| Charles Totemoff | Native Landowners |
| Howard Valley | Forest Products |
| Ed Zeine | Local Government |

Ex-Officio Members

| | |
|------------------|---------------------|
| Sen. Loren Leman | Alaska State Senate |
| Rep. John Harris | Alaska State House |



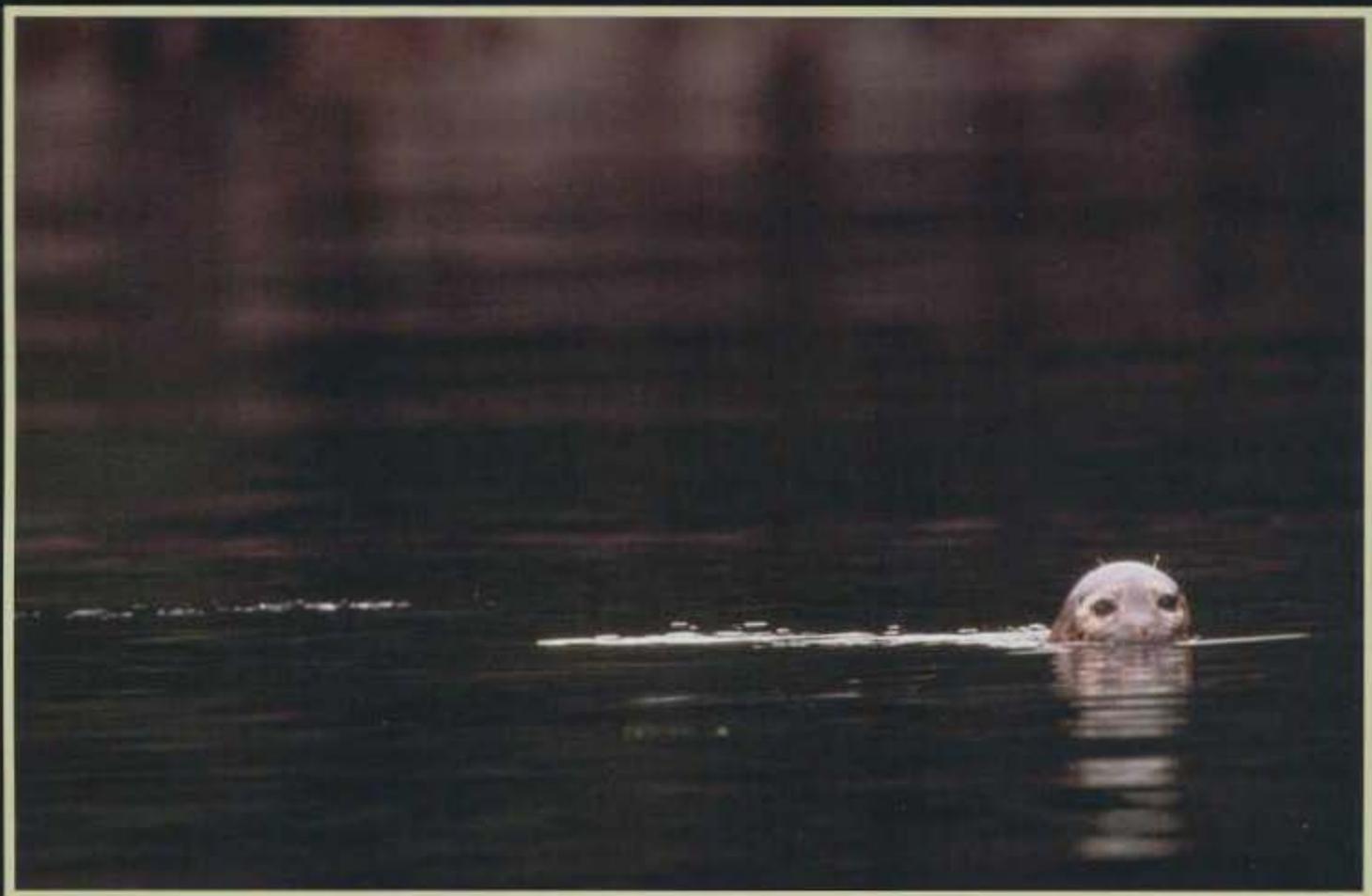
Trustee Council Executive Director
Molly McCammon

Writing, Editing & Design
Joe Hunt

Printed by
Northern Printing

The bald eagle was the first of the injured resources to be declared recovered. By 1996, the population of bald eagles in Prince William Sound was estimated at 6,000, matching the area's pre-spill population. Photo by Roy Corral

Back cover: The harbor seal, an important food source for subsistence users and a visual treat for tourists and recreational users, has declined by 80 percent in Prince William Sound during the last 20 years. The population continues to decline by about 5 percent annually. Photo by Natalie Forbes



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