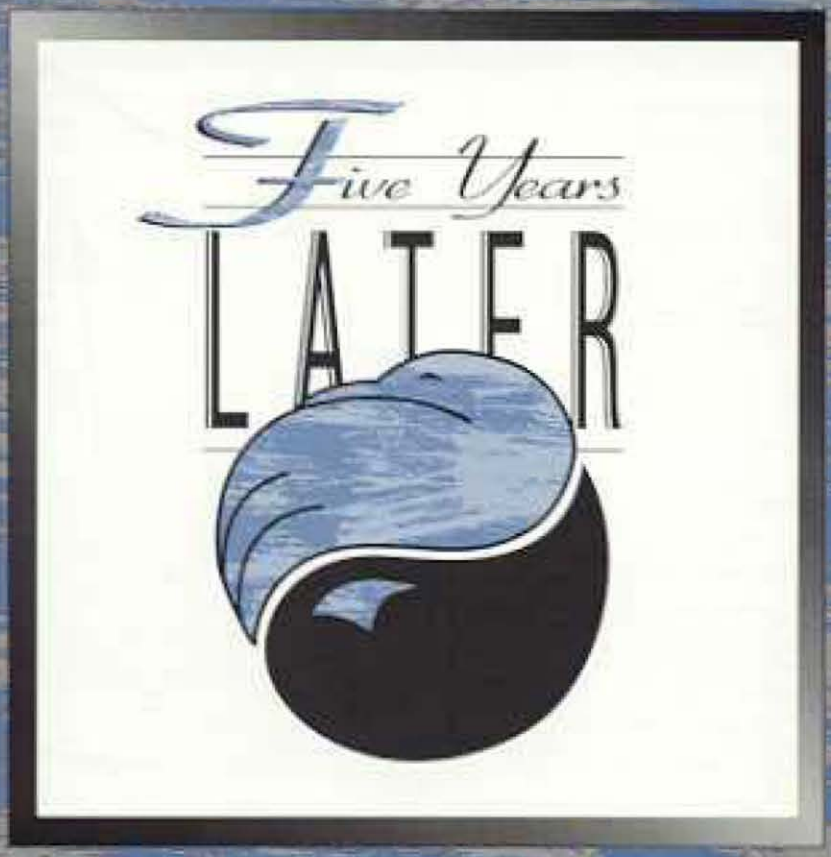


# 1994 STATUS REPORT ON THE EXXON VALDEZ OIL SPILL

EXXON VALDEZ TRUSTEE COUNCIL

March 1994

# 1994 STATUS REPORT ON THE EXXON VALDEZ OIL SPILL

For the Future

LATER

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# MISSION STATEMENT

## THE MISSION

of the Trustee Council and all participants in council efforts is to efficiently restore the environment injured by the Exxon Valdez oil spill to a healthy, productive world renowned ecosystem, while taking into account the importance of quality of life and the need for viable opportunities to establish and sustain a reasonable standard of living.

The restoration will be accomplished through the development and implementation of a comprehensive interdisciplinary recovery and rehabilitation program that includes:

- Natural Recovery
- Monitoring and Research
- Resource and Service Restoration
- Habitat Acquisition and Protection
- Resource and Service Enhancement
- Replacement
- Meaningful Public Participation
- Project Evaluation
- Fiscal Accountability

*Adopted by the Trustee Council at its November 30, 1993 meeting.*

# EXECUTIVE FROM THE DIRECTOR

The Trustee Council hired me as executive director last November with clear directions to develop a comprehensive, ecosystem-based approach to implementing the Restoration Plan for the *Exxon Valdez* oil spill area.

The Trustees also directed me to streamline the process, reduce overall administrative costs, and improve communications with the public. My excitement at taking on the challenge was surpassed only by realization of the overwhelming responsibility we face. Obviously, this is a charge that can only be accomplished through a unified effort. I am pleased to report that this challenge is being met and progress made in large part due to the efforts of those who laid the foundation before me, combined with the dedication of the people now cooperating to achieve restoration goals ■

State and federal attorneys developed the Trustee Council restoration program soon after the spill as part of their pursuit of liability claims under terms of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). But while CERCLA adequately guides the attorneys as they seek to determine financial responsibility for damages, it provides little management guidance to the state and federal trustees who must direct both the response to an environmental catastrophe and the restoration of the ecosystem ■

For that reason, despite the hard work and accomplishments of federal and state employees and the public, one of the largest environmental disasters in North America has thus far been defined in terms of legal warfare, rather than ecological restoration ■

One of the first steps we took was to work with the Trustees to develop a mission statement that reflects our commitment to demonstrate that we can restore and live within a pristine environment without "consuming" it. We are working with scientists and the public to build a framework with clearly stated goals, objectives, and strategies to move forward with our mission. We have sought to improve our management structure by making changes guided, in part, by information gained at several workshops involving agency personnel, the Public Advisory Group, scientists and members of the general public ■

JAMES R. AYERS
*EXECUTIVE DIRECTOR*

The public must have a clear understanding and ownership of the Trustee Council's mission statement, goals and objectives in order to participate meaningfully and be an effective part of the process of restoring an injured environment. There will be no lasting restoration without the public's participation. Further, the public must have access to straightforward accounts of what we're doing, why we're doing it, and how much it costs ■

The Trustee Council has adopted a balanced approach, with three areas as the major focus of its mission: general restoration, habitat protection, and research and monitoring ■

In our restoration activities, we will continue to identify areas of the ecosystem that will recover more rapidly through the use of cost-effective restoration measures. Habitat protection activities will center on establishing a "safety net" of support within the system by identifying and protecting key biological areas in the oil spill region. Last, and perhaps most important, we will establish an integrated long-term ecosystem research and monitoring program ■

The information we develop will be user-friendly and readily available to resource managers, scientists, students and the public. This is ultimately the key to lasting prudent management decisions, but it will not happen overnight. We are talking about a 20 to 30 year effort. To that end, the Trustees have set in motion the creation of a reserve fund to support ecosystem restoration, research and monitoring over the long term ■

The *Exxon Valdez* oil spill was undoubtedly one of the most significant environmental disasters ever to hit North America. It resulted in a record court settlement of over a billion dollars. Like many other disasters, useful knowledge may yet come from this one. We hope the model we are developing for damage assessment and restoration will contribute to our society's acceptance of responsibility for the environmental tragedies we cause. We must develop a process that allows us to quickly apply our best talents and technologies toward overcoming the damages from environmental abuses and ecodisasters, instead of simply leaving them for the next generation to confront. Together we are proceeding on our course towards accomplishing the mission of the Trustee Council ■

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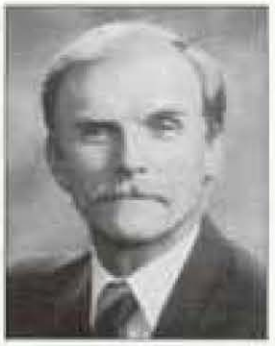

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*Alaska State Senate, Ex Officio Member*

# INTRODUCTION

A few minutes after midnight on Good Friday, March 24, 1989, the supertanker *Exxon Valdez* ran aground on a well-marked reef in Prince William Sound.

The impact ripped open eight of eleven cargo tanks in the vessel, and within a few hours 10.8 million gallons of Alaska North Slope crude oil had leaked into one of the most bountiful and diverse marine ecosystems in the world.

Over the following weeks, storm winds and prevailing currents carried the oil out of the sound, oiling beaches on the Kenai Peninsula, the Gulf of Alaska, Kodiak and the Alaska Peninsula, extending hundreds of miles from Bligh Reef, the site of the wreck.

Many species of wildlife living in or near the sea are susceptible to the toxins in petroleum or to the viscous, coating effect of crude oil. Consequently, thousands of seabirds, sea otters, shellfish and other marine life in the path of the oil from the *Exxon Valdez* were killed by exposure to the oil. Scientists say exact mortalities for many species will never be known because the corpses sank, were washed to sea, or were eaten by scavengers, which may have then also died from ingesting oil.

The tanker's owner, Exxon Corporation, mounted an extensive cleanup effort in the spring and summer of 1989, employing thousands to wash the beaches with hot and cold water, remove oiled sediments and apply chemical fertilizers to aid in bacterial breakdown of the oil residues. Cleanup crews on a smaller scale returned during the summers of 1990, 1991 and 1992, mostly to remove oiled sediments and to keep track of changing conditions on the beaches.

Soon after the spill, trustees representing state and federal resource agencies were appointed under the authority of the federal Comprehensive Environmental Response, Compensation and Liability Act and the Clean Water Act to plan and mobilize a natural resource damage assessment program to determine the nature and extent of the injuries. A planning framework was established and peer reviewers retained to provide independent scientific review of on-going and planned studies and to assist with the synthesis of their results. In the latter part of 1989, the trustee agencies, with the assistance of the Environmental Protection Agency, initiated planning for restoration activities that would be undertaken after the response, cleanup and damage assessment phase was over.

On October 8, 1991, an agreement was approved by the United States District Court to settle the claims of the United States and the State of Alaska against Exxon Corporation and Exxon Shipping Company for

various criminal violations and for recovery of civil damages resulting from the oil spill.

According to the civil consent decree between Exxon and the state and federal governments, Exxon must make ten annual payments totaling $900 million for injuries to natural resources and services, and for the restoration and replacement of natural resources. The first payment was made in December 1991; the last payment is due in September 2001. Three payments totaling $340 million have been received as of March 1994.

A Memorandum of Agreement between the state and the federal governments defines the management structure and constraints which govern how the civil settlement funds are spent. Six Trustees were appointed, three state and three federal representatives from public agencies which, with the exception of the State of Alaska Attorney General, have natural resource management responsibilities related to resources injured by the spill.

The Memorandum of Agreement provides the rules for spending the restoration funds:

- *Restoration funds must be used "...for the purposes of restoring, replacing, enhancing, or acquiring the equivalent of natural resources injured as a result of the Oil Spill and the reduced or lost services provided by such resources ..."*
- *Restoration funds must be spent on restoration of natural resources in Alaska unless the Trustees unanimously agree that spending funds outside of the state is necessary for effective restoration.*
- *All decisions made by the Trustees (such as spending restoration funds) must be made by unanimous consent.*

The Trustee Council uses funds from the civil settlement for activities to restore injured resources and services. Since the October 1991 settlement, the Trustees have selected and organized a team to define and carry out restoration objectives, conducted their business in 28 public meetings, and authorized 135 projects to assess spill effects and implement restoration programs.

After soliciting extensive public comment, the Trustees developed a draft long-term Restoration Plan to identify priorities and guide expenditures from the fund.

The Draft Restoration Plan was released to the public in November 1993, and a draft Environmental Impact Statement is being prepared to analyze potential effects. It is anticipated the final Restoration Plan will be adopted by the Trustee Council in late 1994.

*Harbor seal populations were already decreasing in Prince William Sound prior to 1989, and injuries sustained because of the oil spill appear to have hastened their decline. In the spring of 1993, researchers glued satellite-linked transmitters with epoxy to 12 healthy harbor seals. The transmitters were shed harmlessly during the autumn molt, after they had provided critical information about harbor seal movements, such as how deep the animals dive and the length of time they stay underwater.*

Photo by David Lewis, ADF&G

# SUMMARY OF INJURIES

BY
DR. ROBERT SPIES,
Chief Scientist

ON March 24, 1989, data on the natural resources at risk from an oil spill in Prince William Sound were incomplete and out of date. Understanding the harm caused by the spilled oil was crucial to future restoration efforts as well as to support damage claims, and the necessary scientific surveys were thus mounted by state and federal resource agencies. The research goals were very different from those of the cleanup so much in the public eye. The scientists needed to survey the damage, track recovery, and eventually find ways to help restore the entire injured marine ecosystem — from simple invertebrate organisms, shellfish, fish, birds, ducks, and marine mammals to subsistence resources and archaeological sites.

## INTERTIDAL COMMUNITIES

The *Exxon Valdez* spill oiled more than 1,500 miles of Alaska coastline, resulting in significant impacts to shoreline biological communities, particularly in the upper intertidal zone. Although cleaning removed much of the oil from the intertidal zone, subsurface oil persisted in many heavily oiled beaches and in mussel beds, which were avoided during the cleanup. Because of little or no pre-spill data, studies of intertidal communities have relied on comparisons of oiled and unoiled sites.

The greatest deposits of oil were stranded in the upper and middle intertidal zones on sheltered rocky shores. In these areas, surveyors found that the seaweed *Fucus gardneri* (rockweed or popweed), barnacles, limpets, periwinkles, clams, amphipods, isopods and marine worms were less abundant on oiled beaches than on unoiled sites. Although surveys found increases in the number of mussels in oiled areas, the mussels were significantly smaller in size than those in the unoiled areas.

While the percentage of intertidal areas covered by *Fucus* was reduced following the spill, the coverage of opportunistic plants that characteristically flourish in disturbed areas was increased. The average size of *Fucus* plants was reduced, as was the reproductive potential of those plants which survived the initial oiling. In 1990, comparisons of the abundance of intertidal fishes found fewer fish in oiled areas versus unoiled areas, but such differences were not apparent in 1991. On sheltered beaches, the data suggest that littleneck clams and, to a lesser extent, butter clams also declined significantly because of the spill.

In 1991, relatively high concentrations of oil were found in mussels and in the dense underlying mat of certain oiled mussel beds. These beds were not cleaned or removed after the spill because of fears that aggressive oil removal would

kill the mussels, which are an important food source for a number of species. These oiled mussel beds now represent potential sources of fresh (unweathered) oil for harlequin ducks, black oystercatchers, river otters, and juvenile sea otters, all of which feed on mussels and showed injury for at least several years after the spill.

Photo © Mark Cunis, NOAA

*Researchers counted mussels and collected samples for analysis as part of a 1993 restoration project. Oiled mussel beds continue to be a problem in the spill region because otters, ducks and sea birds rely on mussels as an important food source. Researchers are exploring methods for removing the oil without killing all the mussels.*

The lower and middle intertidal zones appear to have recovered to a large extent. Recovery in the upper intertidal area will depend on the return of adult *Fucus*. In the absence of a well-developed protective canopy of adult plants, eggs and developing plants of *Fucus* lack sufficient moisture to survive. The reduced canopy of rockweed in the upper intertidal zone also appears to have made it easier for oystercatchers to prey on limpets. Accordingly, the recovery of limpets and other invertebrates also is linked to the recovery of rockweed. Existing adult plants will act as centers for the outward propagation of new plants; recovery of *Fucus* is estimated to take a decade.

There are strong indications that by 1993 the upper intertidal zone, especially on rocky sheltered shores, had begun to recover. Full recovery of the intertidal community may take more than a decade, since it may take several years for invertebrate species to return after *Fucus* has recolonized an area.

While direct oiling killed many organisms, beach cleaning, particularly high-pressure, hot water washing, also had a devastating effect on intertidal life. Several studies have documented the combined effects of oiling and cleanup on beaches, and researchers are now tracking the course of recovery.

## SUBTIDAL COMMUNITIES

While it is often said that oil and water don't mix, enough oil got into the water and sank to the bottom to produce some effects on nearshore species that don't spend much time on the surface. Much of the oil below the tidelines in the nearshore areas probably was deposited on the beach first, mixed with sand and silt, and eventually was washed off the beach by tides, waves and cleanup activities.

Scientists found that small crustaceans, worms and clams associated with eelgrass beds were much less abundant in oiled areas a year after the spill, although by 1991 these differences had narrowed considerably. Even without data prior to

1989 on these subtidal communities, their history since 1989 indicates an effect from the spill.

Likewise, nearshore fish like yellow-fin sole and Dolly Varden trout had oil residues in their gall bladders two years after the spill. However, by the summer of 1990 the amounts in Dolly Varden bile had greatly decreased. Dolly Varden and Cutthroat trout grew less in oiled than in unoiled areas of Prince William Sound for two years after the spill. Although prespill data on the growth of these species is lacking, the evidence of exposure, along with the known effects of hydrocarbons on growth of animals, clearly pointed a finger at the spill.

Photo by J.J. Isaac, ADEC

*Workers from state and federal agencies and nearby communities participated in a follow-up survey of oiled shorelines, primarily in Prince William Sound, during the 1993 field season. They found that subsurface oil has been reduced naturally by about half in the last two years. Where oil remains on the surface it has stabilized, and the Trustee Council is funding further surveys and a program to remove surface oil residues in 1994.*

Shortly after the spill there was a great increase in oil-degrading bacteria, even up to 100 meters below the water's surface in some areas. These bacteria have played a major role in cleaning up the nearshore areas. Although no measurable oil remains in the water — that was gone within the first year — oil will still be detectable in the sediments in many shallow spill areas for at least several years to come.

## BIRDS

Bird mortalities due to the spill may have totaled as many as half a million, affecting roughly 90 species of birds and ducks. Insulating feathers soaked up the oil, with even the thinnest film of oil compromising the animal's ability to survive. As oil accumulated, matted feathers allowed cold water to soak through to the skin, heat was lost, and the animal suffered from hypothermia. Normal preening and grooming behavior often resulted in the animal ingesting toxic doses of oil.

### Common Murres

Not all birds were equally at risk. Species which spend most of their time on the water's surface were most vulnerable, especially common murres, black and white colonial sea birds that nest on rocky islands dotting the continental shelf along the northern Gulf of Alaska. At the

major breeding colonies studied — the Chiswell Islands, the Barren Islands, Puale Bay and the Triplets — more than 120,000 adult breeding birds may have been lost.

Researchers did not observe murres laying any eggs on the Chiswell Islands in 1989. The timing of murre breeding was delayed by about a month at the colonies which were most heavily oiled, such as the Barren Islands. This change in breeding behavior continued for at least several years, and it is probable that the chicks produced there were unable to survive the early autumn storms of the Gulf of Alaska. Only in the last couple of years has murre reproduction begun to return to normal. It may be several decades before the colonies have recovered.

*About 75 percent of the 35,000 bird carcasses recovered during and shortly after the oil spill were common murres. As part of an on-going program to understand and mitigate the effects of the spill on murres, researchers in 1994 will monitor trends in population and reproduction at murre colonies in the Barren Islands affected by the spill.*

## Marbled Murrelet

The marbled murrelet was another open water foraging bird affected by the spill. As many as 12,000 birds were killed, which represented perhaps 5 to 10 percent of the population of the spill area. The Alaska strongholds for this small bird are Prince William Sound and the Kodiak Archipelago, although murrelets have been declining in Prince William Sound since the early 1970's. This species is of special concern because its numbers are perilously low at the southern end of its range in Washington and Oregon.

Studies done with Trustee Council funds in 1991 and 1992 identified the prime nesting habitat of this species as moss-covered limbs of old growth hemlock and spruce. The Trustees have taken actions to protect this diminutive bird well into the future by protecting some lands that have been identified as critical murrelet habitat. In 1994 oil spill funds will also support research work on the foraging habits of this species. The goal is to determine whether fluctuations in stocks of the small fish that marbled murrelets feed on may also be related to their decline.

## Bald Eagles

Bald eagles encountered floating oil while preying on fish and oil-contaminated carcasses. When eagle plumage was heavily oiled, it became impossible for them to fly and probably also contributed to loss of body heat. Normal preening behavior also exposed eagles to oil by ingestion. More than 150 eagles were found dead after the spill. Just how many of the approximately 8,000 or so eagles estimated to be living in the spill area were killed is

uncertain— probably somewhere between 200 to 900. Surveys to estimate breeding success indicated that in 1989, 85 percent of eagle nests in moderately and heavily oiled areas failed, compared to 55 percent in lightly oiled and unoiled areas. In 1990, increases in breeding success observed in oiled versus unoiled areas suggested that the setback to eagle reproduction was temporary. Though it is difficult to determine exact numbers of eagles through population surveys, researchers estimate that bald eagle populations may be nearly recovered by 1994.

### Other Birds

Numerous other bird species were affected by the spill, both birds that live on open water and those that forage along the shoreline. The most direct evidence of injury came from the tens of thousands of carcasses of birds found on the beaches after the spill in 1989. In general, the number of dead birds recovered probably represents only 10 - 15 percent of the total number of individuals killed. Some of the other species found dead included pigeon guillemots, falcons, ducks, sandpipers, phalaropes, gulls, terns, auklets, puffins, various passerines, loons, grebes, shearwaters, petrels, cormorants, kittiwakes, and geese.

For most species, there are no reliable prespill data that will allow accurate assessment of the significance of estimated losses or other apparent problems. For example, the volume of black oystercatcher eggs and the weight of chicks raised in oiled areas were lower compared to those raised in unoiled areas. However, because there are no prespill data, it is not certain whether these effects are due to exposure to oil, feeding in oiled mussel beds or to some other factor.

Additional data on injuries to birds came from boat surveys carried out after the spill using techniques similar to surveys conducted in 1972-1973 and 1984-1985. These surveys indicated that northwest crows, cormorants, Arctic terns and tufted puffins had declined more in oiled than in non-oiled areas since the earlier surveys.

## MARINE MAMMALS

### Sea Otters

Sea otters were at risk from exposure to oil for some of the same reasons as birds: oil on sea otter fur disrupts its ability to insulate and aid in buoyancy, and normal fur grooming behavior resulted in the ingestion of oil. The immediate sea otter death toll was probably about 4,500.

Within Prince William Sound up to 30 percent of the otter population may have been killed. There are strong indications that sea otter survival the first winter after the spill was poor, particularly for pups in the spill area. For several years after the spill, researchers found carcasses of otters in their prime in much higher proportions than usual in the spill


area. The poor survival rate of sea otters released from rehabilitation centers was also disappointing.

Surveys of sea otter populations in Prince William Sound since 1990 predict that recovery will be slow, with a population growth of about 5 to 9 percent per year. Aggressive movement into the sound by otters from the Copper River Delta and the Kodiak Archipelago could improve the prospects quickly; future surveys will contribute to the data on injuries to sea otters.

## Seals

The oil slicks that raced through Prince William Sound blackened prime haulouts for hundreds of harbor seals just as the pupping season approached. As seals emerged from the water they rested on the oil-coated shoreline and were soon blackened themselves. Up to 80 percent of seals in the hardest hit colonies were oiled. Unlike sea otters, seals carry their insulation as blubber under the skin. This made the seals immune to hypothermia, but did not protect them from the toxic components in the oil. Many seal pups born in the spring of 1989 were also coated with oil.

Since they had collected population data just the previous fall, the Alaska Department of Fish and Game was prepared to measure the impact of the spill on harbor seals. Fish and Game staff flew low over the islands forming the spine of the sound again in the fall of 1989, photographing seals at many of the main haulout areas. When the data were analyzed it appeared that about 300 harbor seals were missing.

A year after the spill, pelts of the survivors appeared clean, but the effects of the spill could still be found in the presence of elevated residues of oil compounds in the seals' internal organs. Fall surveys in subsequent years continue to reflect the same differences between seal populations in oiled and unoiled areas observed in 1989. These data also indicate the population may be stabilizing. This is encouraging news, for harbor seal populations in the region have been declining throughout the 1980's.

## Whales

In the days and weeks after the spill, slicks were seen in waters known to be favorite habitats of Orcas (killer whales) and humpback whales. Researchers were concerned that whales, when they surfaced, might be exposed to enough oil to cause them harm, especially from breathing toxic hydrocarbon vapors.

National Oceanic and Atmospheric Administration scientists had accumulated a photographic catalog from prespill encounters with whales in this area. After conducting a census for two years after the spill, researchers concluded that the humpback whale population showed little indication of lasting effects from the spill.

The situation with one of the groups or pods of killer whales was much more serious. In 1989 seven animals from the AB pod were missing for an unprecedented mortality rate of 19.4 percent. In 1990, an additional six individuals were missing, which indicated an annual mortality rate of 20.7 percent. Typical prespill mortality for this pod ranged from 3.1 - 9.1 percent. In addition, no births were recorded in 1989 or 1990.

Due to the fidelity of killer whales to the pod and the strong bonds observed between mothers and calves, the missing whales are presumed to have died, though no killer whale carcasses were ever recovered.

The cause of death of the killer whales is uncertain. Based on current knowledge of whale biology, the circumstances of the spill and the toxicity of crude oil, these deaths might not be due to contact with oil spilled by the *Exxon Valdez*. Regardless of the cause of the decline in numbers, Trustee Council surveys have observed that several calves were born in the last 3 years. It appears that the AB pod will probably recover to prespill condition around the turn of the century.

## FISH

### *Pink Salmon*

As the oil moved through Prince William Sound and out into the Gulf of Alaska, the slicks were also swept into the mouths of streams where salmon breed and where the salmon fry were soon to emerge from the gravel and find their way to saltwater. Seventy-five percent of the wild pink salmon in the sound spawn at the mouth of streams. There was no apparent change in the use of this habitat by fish in the summer of 1989, and many salmon deposited their eggs in the intertidal portion of oiled streams.

Photo by John Hyde, ADF&G

*Trustee studies have documented injuries to several commercially important fish species, such as herring, pictured here, and pink and sockeye salmon. Projects planned and underway will continue to assess the nature of the injuries and take action to restore damaged fish stocks.*

In the autumn of 1989, egg mortality in oiled streams averaged about 15 percent, compared to about 9 percent in unoiled streams. Since 1989, egg mortality in the oiled areas has generally increased. In 1991 and 1992 approximately 40 to 50 percent of the salmon eggs in oiled streams did not survive, as compared

to an 18 to 30 percent mortality in unoiled streams. In 1993, though the rates of egg mortality had dropped to an average of less than 25 percent in oiled streams and less than 15 percent in unoiled streams, the differences still persisted.

Although the differences between salmon egg mortality in oiled and unoiled streams over the first two years were likely attributable to the effects of oil, scientists did not expect these differences to persist as long as four years after the spill. At first they thought oil was directly affecting survival of the pink salmon eggs, but as the amount of oil on the shorelines decreased, other explanations began to seem more plausible. Perhaps there was a genetic effect in the young which carried over to adulthood, and was even inherited by the next generation.

Researchers also suspected that the characteristics of the stream might play a role in egg mortality independent of effects of the oil. For example, most oiled streams were on rocky points, whereas unoiled streams were found in the backs of bays and inlets. Perhaps differences in the severity of natural conditions were contributing to mortality.

Then in 1993 this story took another turn. Returning adult pink salmon were captured as they entered oiled and unoiled streams, their eggs spawned in the laboratory and raised under controlled conditions. This experiment showed that the differences in egg mortality between pink salmon from the oiled and unoiled streams when both were raised in the laboratory were as great as the differences seen in the wild, essentially eliminating environmental factors from consideration. It now appears there is an inheritable difference in egg mortality for fish from oiled versus unoiled streams. The interpretation of these results is further complicated by the recently discovered fact that some fish sampled might not have originated at the stream where they returned to spawn. This egg mortality might translate into a decline of as much as 10 percent in the entire adult pink salmon run in Prince William Sound if all the other factors which contribute to salmon mortality are added together with the oiled stream effects.

Besides the fate of eggs laid in oiled gravel, the juvenile fish emerging into Prince William Sound in the spring of 1989 encountered oil in the water as slicks and small droplets, which were consumed along with food. Circumstantial evidence from tagged juvenile salmon points to growth retardation as an effect of the spill, which may have in turn affected the strength of the 1990 run. This indicates that despite the large size of the 1990 run of pink salmon, it might have been even larger, perhaps by as much as 1.9 million fish, if the spill had not occurred.

In 1992 and 1993, extremely low returns of pink salmon to Prince William Sound resulted in dire effects on the commercial fishery. The exact causes of these poor returns are not known. The

effect of the oil spill on early salmon life, changes in climate affecting conditions in the Gulf of Alaska, decreases in food sources for juvenile fish growth in the last several years, and hatchery-wild stock interactions have all been proposed as contributing to the current poor state of the fishery. Trustee-sponsored programs for salmon are now shifting from injury determination to studying this species within the context of the ecosystem. Restoration and enhancement of pink salmon will depend on better knowledge of the ecological interactions of this species, namely sources of food and predation by large fish, particularly during its early life history.

The Trustee Council has embarked on a multi-million dollar research and monitoring program to attempt to understand these fishery declines and to identify effective restoration actions. A significant segment of the 1994 work plan is devoted to fishery research with these goals in mind.

## Herring

Shorelines in the spill region also included about 5-10 percent of the spawning habitat of Pacific herring. In 1989 and 1990 there were greater rates of abnormal development of herring larvae in oiled areas than in unoiled areas. There was also evidence gathered in 1992 that oil may have had an effect on herring reproduction. Like pink salmon, strong runs of herring right after the spill were followed in 1992 and 1993 by poor returns.

Fisheries biologists also observed the appearance of a high rate of infection by a virus in the Prince William Sound herring population. The fishery has seen a very poor return of the 1989 brood year.

It should be noted that it is not possible to blame the poor return of herring solely on the oil spill. The decline may be due to natural causes, or to some combination of oil spill effects with natural causes. Although there is not enough data to be certain, the Trustee Council is supporting studies to learn more about the factors which affect herring production.

## Sockeye Salmon

In 1989 the oil that left Prince William Sound traveled along the Kenai Coast and entered the southern part of Cook Inlet, a rich commercial fishery area. The prospect of oil-fouled gear and fish prompted the Alaska Department of Fish and Game to close the sockeye salmon mixed stock fishery in Cook Inlet.

As a result of this closure, there were higher than usual returns (overescapement) of spawning fish to the Kenai and Red Lake systems in 1989. This was the third consecutive year of salmon overescapement in the Kenai River system, due to a previous oil spill in 1987 and naturally high overescapement in 1988.

The apparent cumulative effect of too many spawning adults in the Kenai River system has been a decline in salmon smolt production. Although the exact mechanism by which this occurs is not clear, fisheries scientists believe that the availability of food is insufficient to meet the needs of the large number of fry produced. Fewer fry surviving their first winter in rearing lakes result in fewer smolt migrating to the ocean in the spring. Smolt production in the Kenai River system has declined as follows: 1989 — 30 million; 1990 — 6 million; 1991 — 2.5 million; and in 1992 and 1993, less than 1 million. The forecast is for returns in 1994 and 1995 to be below escapement goals.

## ARCHAEOLOGICAL RESOURCES

The areas of Alaska affected by the *Exxon Valdez* oil spill have been occupied by Native peoples for at least 11,000 years. It is estimated that the spill area contains over 3,000 sites of archaeological and historic significance.

Currently, 24 sites are known to have been adversely affected by clean-up activities, looting or vandalism related to the oil spill. It is estimated that over 100 total sites were similarly affected, and injuries attributed to looting or vandalism linked to the oil spill are still occurring and on the rise because of on-going human intrusion into previously pristine areas.

Restoration cannot regenerate what has been destroyed, but it can successfully prevent further degradation of sites and preserve the scientific data. During the 1994 field season archeologists will continue work begun in 1993 to conduct site-specific restoration actions at thirteen sites within the oil spill pathway. The Trustee Council will continue to support projects to document injured locations and preserve the artifacts and scientific data which remain in the vandalized sites.

## SUBSISTENCE RESOURCES

Native communities in the spill region have relied heavily on subsistence resources for many generations. Resources used include salmon, halibut, cod, and other fish; marine invertebrates such as clams, shrimp and crabs; marine mammals such as seals; land mammals such as deer; birds and bird eggs; and wild plants. Many families felt they could no longer trust the safety of their traditional foods after the oil spill, and use of these subsistence resources declined significantly in some communities.

Representatives of a number of organizations formed an Oil Spill Health Task Force to conduct subsistence foods testing and to inform community members of their findings. Since 1990, the Task Force has advised that all the fish, deer, ducks, seals and sea lions tested as part of the subsistence program were found to be safe to eat, but recommended against using shellfish from beaches where oil is still present.

*In the fall of 1992, representatives from five villages visited the National Marine Fisheries Service laboratory in Seattle where samples of subsistence foods are analyzed for the presence of hydrocarbons. Members of the Oil Spill Health Task Force then review the laboratory findings and provide advice to villagers about the safety of their traditional foods. This program is funded by the Trustee Council to address concerns of residents of the 15 villages in the spill area, who rely heavily on fish, shellfish, ducks, and other marine wildlife and plants for their food sources.*

Staff of the Alaska Department of Fish and Game in 1993 contacted community members to find out if there were remaining concerns regarding the safety of subsistence foods in areas affected by the spill. After a series of community meetings and discussions, it was decided to again test subsistence samples from a number of traditional use areas. Information from those tests was provided to the communities.

In addition, five representatives from the affected villages traveled to the National Marine Fisheries Service laboratory in Seattle to observe the process of testing and analysis of subsistence food samples first-hand, and to have their questions about the findings answered directly by the scientists who conducted the tests.

The Trustee Council will continue support for subsistence foods safety testing in 1994 in order to address the concerns of the communities who rely so heavily on these resources for their food sources.

## CONCLUSION

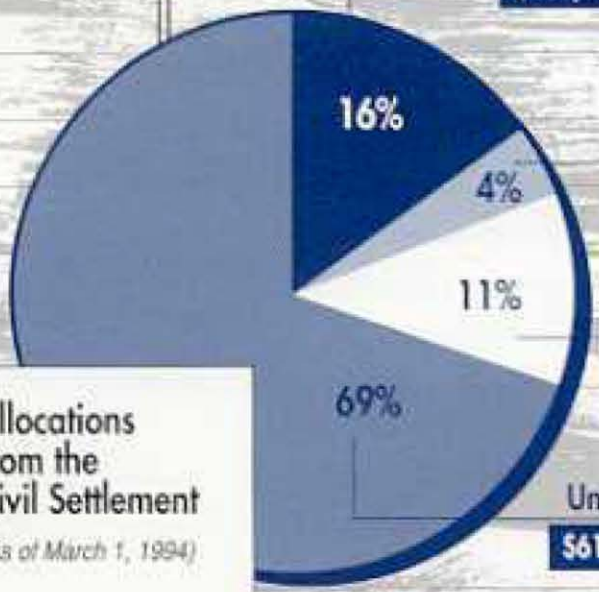
Five years after the spill, Trustee Council-sponsored research has documented the severe immediate impact of the *Exxon Valdez* oil spill on vulnerable species and communities of the Alaska marine ecosystem. Many of these are well on their way to recovery or have already recovered. However, other parts of the ecosystem have not recovered. It is still unclear when full recovery will be achieved.

On some future anniversary of the spill, if people can walk the beaches and find no fresh oil, and the health of the ecosystem has been fully restored, then all Americans can truly celebrate the close of this unfortunate chapter of Alaskan history ■

*NOTE: For more detailed information about the effects of the Exxon Valdez oil spill on resources and services, and on actions of the Trustee Council, contact the Oil Spill Public Information Center at 645 G St., Anchorage, AK 99501 or call 907/278-8008, toll free from within Alaska at 800/478-7745, outside Alaska at 800/283-7745.*

# FINANCIAL SUMMARY

In the civil settlement, Exxon Corporation agreed to pay the United States and the State of Alaska $900 million over a 10-year period to restore resources injured and services reduced or lost as a result of the *Exxon Valdez* oil spill. As of September 1993, $340 million of the $900 million has been paid.




**Allocations from the Civil Settlement**

*(As of March 1, 1994)*

**TOTAL: $900,000,000**

**Reimbursements to Governments**
**$139,111,300**

**Exxon Cleanup Deduction**
**$39,913,700**

**Annual Restoration Work**
**$102,739,100**

**Uncommitted**
**$618,235,900**

A total of about $282 million, almost one-third of the civil settlement, has been spent or budgeted. Of that amount, about $140 million was reimbursed to the state and federal governments for past expenditures related to the oil spill incurred from 1989 through 1991; about $40 million was credited to Exxon for cleanup expenses during 1991 and 1992; and approximately $100 million has been spent or committed through annual restoration work.

Forty-two percent of the $100 million committed to annual work has thus far been allocated to Habitat Protection. Monitoring and Research projects received 12 percent. General Restoration and Public Information/Administration each were allocated 12 percent. A similar proportion was set aside in a Restoration Reserve for long-term restoration and research activities. In 1992 and 1993, a small proportion was spent on completing damage assessment studies. The figures reported for the 1993 Work Plan reflect a seven-month period of transition to the federal fiscal year, which began October 1, 1993. ■

## Annual Restoration Work Allocation[1]

| | SPENT 1992[2] March 1, 1992 - Feb. 28, 1993 | BUDGETED 1993 March 1 - Sept 30, 1993[3] | BUDGETED 1994 Oct. 1, 1993 - Sept. 30 1994 | TOTAL | PERCENT |
|---|---|---|---|---|---|
| Public Information & Administration | $3,821,000 | $4,135,800 | $4,224,800 | $12,156,800 | 12% |
| Damage Assessment | $4,978,300 | $782,100 | | $5,765,400 | 5% |
| General Restoration | $3,077,200 | $3,927,700 | $5,415,000 | $12,414,900 | 12% |
| Habitat Protection | $1,027,700 | $39,732,200[4] | $2,245,100 | $43,005,000 | 42% |
| Monitoring & Research | $985,400 | $4,335,200 | $12,076,400 | $17,397,000 | 17% |
| Restoration Reserve | | | $12,000,000 | $12,000,000 | 12% |
| *TOTAL* | *$13,889,600* | *$52,913,000* | *$35,936,500* | *$102,739,100* | *100%* |

[1] These figures reflect financial information available as of March 1, 1994.

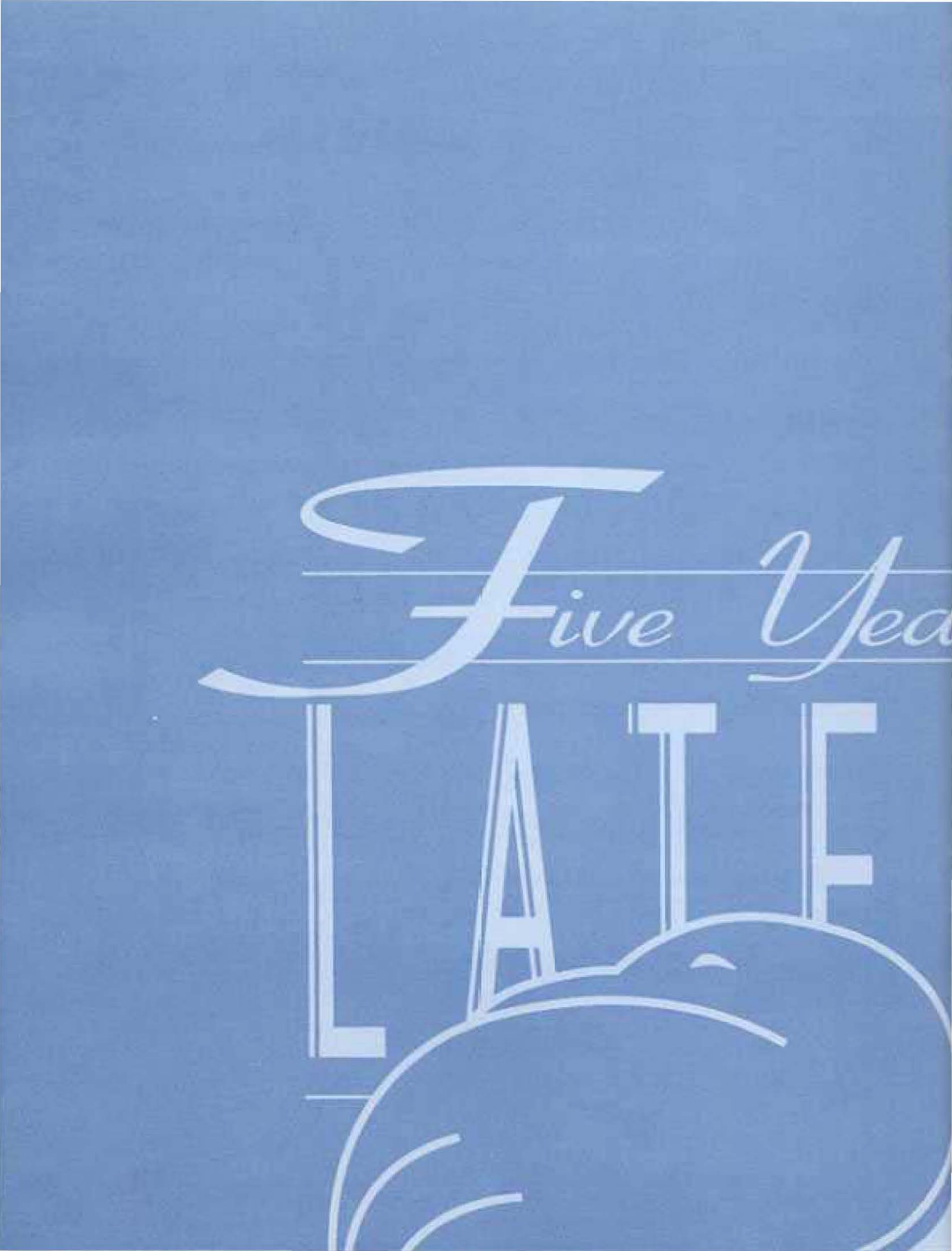
[2] These are preliminary numbers subject to budget reconciliation.

[3] The figures reported for the 1993 Work Plan are for the period 3/1/93 to 9/30/93, a period of transition to the federal fiscal year, which began 10/1/93. Preliminary actual expenditures will be available soon, and are expected to be less than the budgeted amounts. Figures for the period 10/1/92 to 2/28/93 are included in the 1992 column.

[4] This sum includes $7.5 million which were combined with $14.5 million from other sources for the purchase of private inholdings in Kachemak Bay. Another $29,950,000 was committed by resolution of the Trustee Council August 23, 1993 for the initial payment for purchase of private land near Seal Bay on Afognak Island. The total purchase price of this transaction is $38,700,000 with the balance to be paid in three annual installments.

SOURCES: Application to the Court for Disbursements of 6/15/92, 1/19/93, 6/2/93, 8/23/93, 12/16/93.

This report is intended to be a summary only. More detailed financial information is available by contacting the Oil Spill Public Information Center 645 G Street, Anchorage, Alaska 99501 or call 907/278-8008, toll free within Alaska at 800/478-7745, toll free outside Alaska at 800/283-7745.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# 1994 STATUS REPORT ON THE EXXON VALDEZ OIL SPILL


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