EIS
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Introduction to No Action Alternative
- what happens without TC intervention
- Natural Recovery
- How recovery estimates are made < complications / modeling
- defines recovery variables
  - prespill
  - comparisons to control
- defines - length of time to reach recovery - rate
  - confidence
  - protection
  - variability

EIS
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Five Years LATER

1994 STATUS REPORT ON THE EXXON VALDEZ OIL SPILL

EXXON VALDEZ TRUSTEE COUNCIL

March 1994

1994 STATUS REPORT ON THE EXXON VALDEZ OIL SPILL

Five Years LATER

TABLE OF CONTENTS

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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

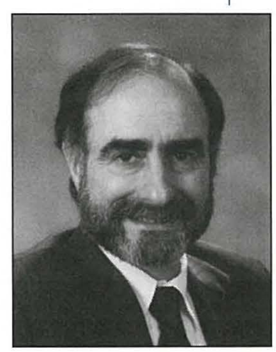
The Trustee Council hired me as executive director last November with clear directions to develop a comprehensive, ecosystem-based approach to implementing the Restoration Plan for the *Exxon Valdez* oil spill area.

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 50 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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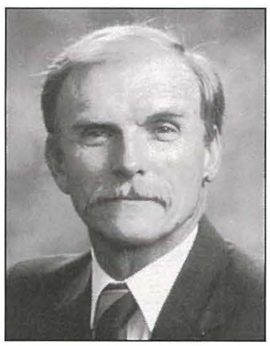

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INTRODUCTION

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 Lloyd Lowry, 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 by Mark Carls, 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 L.J. Evans, 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.

Photo by Art Sowles, USF&WS

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 nonoiled 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.

Photo courtesy of Dean Hughes, ADF&G

In the fall of 1993, 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.

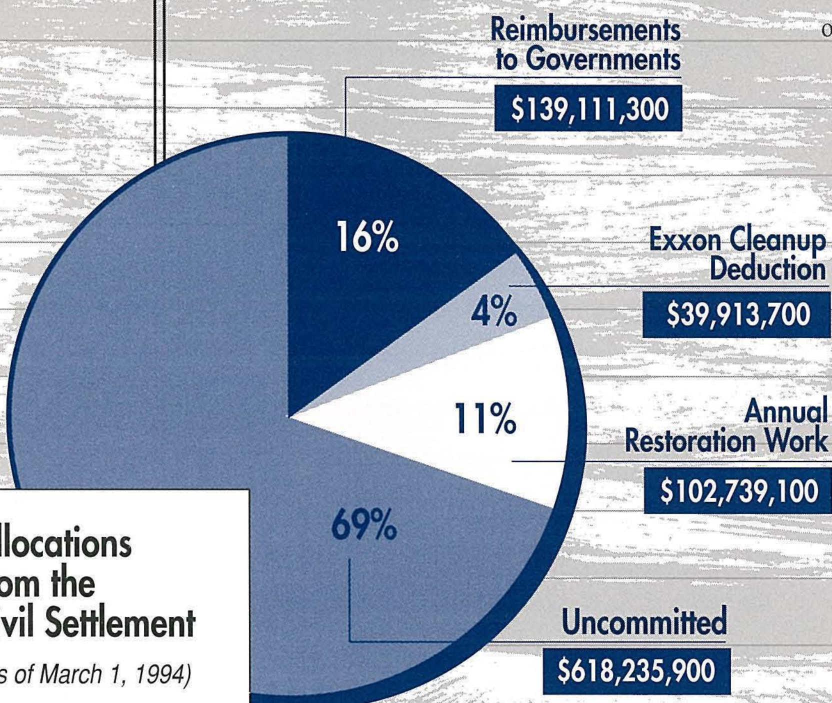
On some future anniversary of the spill, if people can walk the beaches and find no fresh oil, and the health of the ecosystem has been fully restored, then all Americans can truly celebrate the close of this unfortunate chapter of Alaskan history ■

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.

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.



Allocations from the Civil Settlement

(As of March 1, 1994)

TOTAL: $900,000,000

Forty-two percent of the $100 million committed to annual work has thus far been allocated to Habitat Protection. Monitoring and Research projects received 17 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

Five Yea

LATE

1994 STATUS REPORT ON THE EXXON VALDEZ OIL SPILL

Five Years LATER

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Five Years
LATER

WHAT HAVE WE LEARNED ?

EXXON VALDEZ OIL SPILL FORUM

EXXON VALDEZ TRUSTEE COUNCIL

Program

March 22, 1994

FIVE YEARS LATER: WHAT HAVE WE LEARNED?

A public forum sponsored by the Exxon Valdez Oil Spill Trustee Council

March 22, 1994

1:00 PM Call To Order

Looking Back:
March 24, 1989/Slide Program

Welcome and Introductions — JAMES R. AYERS
Executive Director for the Trustee Council

Statement from Governor Hickel — CRAIG TILLERY
State Trustee Representative
Assistant Attorney General
Alaska Department of Law

Statement from the Clinton Administration — DEBORAH L. WILLIAMS
Special Assistant to the Secretary of the Interior for Alaska,
U.S. Department of the Interior

Keynote Speaker:
Placing the Exxon Valdez oil spill in a matrix of world ecosystems — DR. GEORGE ROSE
Research Scientist,
Fisheries & Oceans Canada,
Scientific Program Leader,
Ocean Production Enhancement Nework
NW Atlantic Fisheries Centre, Newfoundland

Why Are We Here Today? — CHARLES P. MEACHAM
Deputy Commissioner,
Alaska Department of Fish & Game

2:35 - 2:45 PM Break

Overview of Research & Monitoring

DR. ROBERT SPIES
Trustee Council Chief Scientist

Nearshore Ecosystem

DR. CHARLES H. PETERSON
Institute of Marine Sciences, University of North Carolina

Toxicology & Distribution of Oil

DR. STANLEY RICE
Program Manager, National Oceanic & Atmospheric Administration

Subsistence

DR. JAMES A. FALL
Program Manager, Subsistence Division, Alaska Department of Fish & Game

Archaeology

DR. TED BIRKEDAL
Chief, Cultural Resources, National Park Service

Fish

DR. PHILLIP R. MUNDY
Fisheries and Aquatic Sciences

Marine Mammals

KATHY FROST
Marine Mammal Biologist, Alaska Department of Fish & Game

Birds

DR. DAVID IRONS
Wildlife Biologist, U.S. Fish and Wildlife Service

Where Do We Go From Here?

STEVEN PENNOYER
Federal Trustee Council Member & Alaska Regional Director National Marine Fisheries Service National Oceanic & Atmospheric Administration

5:30 – 7:00 PM Social Hour
and opportunity to meet the scientists

A public forum
sponsored by the
Exxon Valdez
Oil Spill
Trustee Council

Printed on recycled paper

210
D 9/1
3:00 p.m

CHAPTER V. RESTORATION PLAN ALTERNATIVES

The chapter presents different ways the to use funds from the civil settlement to restore the injuries to resources and services caused by the spill. Each approach, called an alternative, is a scenario that demonstrates the effect of different policy decisions on restoration. If there were no disagreement on how to restore oil spill injuries, or if there was enough money available to complete everything people wanted to do, there would be no need to illustrate different approaches. However, there are differences of opinion on the best methods of using settlement funds, and alternatives show the implications of different policy decisions on restoration.

INTRODUCTION TO RESTORATION ALTERNATIVES

Each restoration alternative is composed of four components: a theme, policy decisions, restoration options, and approximate budget allocations. Table V-1 on the next page summarizes the themes and policies of the alternatives.

Old draft!
pie charts wrong -
See brochure.
Replace Alt 5 with
DRP

TABLE V-1. Summary of Restoration Alternatives

	Alternative 1 Natural Recovery	Alternative 2 Protection	Alternative 3 Limited Restoration	Alternative 4 Moderate Restoration	Alternative 5 Comprehensive Restoration
THEME	No action other than monitoring and normal agency management.	Protect injured resources and services from further degradation or disturbance.	Take the most effective actions to protect and restore injured services and resources whose population has declined. Maintain the existing character of the affected area.	Take the most effective actions to protect and restore all injured resources and services. Increase, to a limited extent, opportunities for human use in the affected area.	Take all reasonable actions to protect, restore, and enhance all injured resources and services. Increase opportunities for human use in the affected area.
VARIABLES					
Injury	N/A	All injured resources.	Injured resources whose populations declined.	All injured resources.	All injured resources.
Status of Recovery	N/A	All stages of recovery.	Resources not yet recovered.	Resources not yet recovered.	All stages of recovery.
Effectiveness of Restoration Actions	N/A	All beneficial actions.	Most effective actions.	Most effective actions.	All beneficial actions.
Opportunities for Human Use	N/A	N/A	Protect existing uses.	Protect or increase existing uses.	Protect, or increase existing uses; encourage appropriate new uses.

Monitoring and information programs are included in all alternatives.
Restoration actions may be undertaken for injured resources, services, or their equivalents.

ALTERNATIVE THEMES. The alternative theme is a description of what the alternative attempts to achieve. It is a general statement of the objectives of the alternative -- a reflection of different answers to four policy questions facing the Trustees.

The theme of Alternative 1, Natural Recovery, is to let the spill-affected area recover on its own, but to monitor recovery and continue normal agency management. In this alternative, the Trustees spend no funds on restoration; they would spend only to monitor recovery. Alternative #1 is a "no-action" alternative required by the U.S. National Environmental Policy Act, Environmental Impact Statement that accompanies the restoration plan. This alternative provides a useful baseline to judge the effects of the other alternatives.

The theme of Alternative 2, Protection, is to protect injured resources and services so they can recover on their own without further disruption. In this alternative, the objective is to fund restoration measures such as land purchases that protect injured resources and services from further stresses, and to let natural processes effect recovery.

Alternatives 3 through 5 represent a progression of restoration actions. These three alternatives progress from a limited to a more expansive view of restoration. The options in Alternative 3, Limited Restoration, address only the most serious resources injuries: those that caused a detectable decline in the population of a resource. The alternative addresses these injuries using only the most effective restoration methods. In addition, in this alternative the Trustees would cease restoration once a population recovered. The alternative also addresses services, but only to the extent of protecting existing uses.

Alternative 4, Moderate Restoration, takes a more expansive approach to injury. It address all injury: population-level, and chronic injuries. It address services by both protecting and enhancing existing use.

Alternative 5, Comprehensive Restoration, takes a further step In this alternative, the Trustees would fund restoration and protective measures aimed at all resources, and would be willing to aid a species even after it recovered. In this alternative, the Trustees would be willing to fund techniques with a lower level of effectiveness. They would be willing to fund restoration for services that goes past protecting or enhancing existing human use, and encourages appropriate new ones.

POLICY DECISIONS. In deciding what restoration actions to fund, the Trustees are faced with a variety of policy decisions. The alternatives illustrate the implications of different answers to these decisions. They do this through the use of four policy questions, or policy variables, summarized in Table V-2. The first two variables apply to resources only; the last variable applies to services only; the third variable applies to both resources and services. Each variable raises a significant policy issue.

Table V-2. Variables Used to Construct Alternatives

VARIABLE	POLICY ISSUE
Injury	Should restoration actions address ALL injured resources or only those whose populations declined because of the oil spill?
Status of Recovery	Should restoration actions cease when a resource has recovered?
Effectiveness of Restoration Actions	Should the plan include only the most effective restoration actions or all beneficial actions, even those less certain of success or likely to produce only slight improvement in recovery?
Opportunities for Human Use	To what extent should restoration actions be used to increase opportunities for human use?

Policy Variable: Injury. Some people believe that restoration efforts should be focused only on those resources that experienced a population decline after the oil spill. They believe that unless the injury was sufficiently serious to detect a difference in population, the trustees should not fund restoration efforts. Others believe that restoration should focus on all resources, including those that experienced a chronic or sublethal injury that did not result in a detectably lower population.

There are a number of reasons why a sublethal or chronic injury may not result in a lower population. These include: the chronic or sublethal injury may not affect the productivity of the species, or the species may have some natural compensating mechanism for the injury. There also may be enough variability in the natural abundance of the species to mask any effect of the injury, or scientific measurement techniques may not be sensitive enough to measure the effect on the spill-area population.

Table V-3 shows which resources showed a population decline, and which showed chronic or sublethal injury without a detectable change in population. The table shows the injuries that occurred as of 1989, the spill year and does not take into account recovery.

Table V-3. Degree of Injury

Resources whose populations declined because of the spill.	Sublethal or Chronic Effects. No Detectable spill-related population decline
Harbor seals	River otters
Sea otters	Bald eagles
Killer Whales	Pink salmon
Common murres	Pacific herring
Marbled murrelet	Rockfish
Pigeon Guillemots	Dolly Varden
Harlequin ducks	Cutthroat Trout
Black oystercatchers	
Sockeye salmon smolts	
Intertidal organisms	
Subtidal organisms	

Policy variable: Status of Recovery. Some people believe that once a resource is recovered, the Trustees should cease their restoration efforts. Others believe that the Trustees should continue restoration, especially protective measures such as land purchases, even after resources recover to where it would have been in the absence of the spill.

Currently, no resources have recovered from population decline. However, some chronic injuries have recovered. As resources recover, this issue will become more important.

Table V-4 shows current expectations about when resources will recover. The information in the table is based on the best available information to agency and peer review scientists. For some species, there is substantial disagreement on the exact mechanism of the injury and how long it will take to recover. For many species, much is unknown about when and how recovery will take places. However, the table below represents the current best estimate of natural recovery, unaided by society's restoration techniques. These estimates will certainly change as recovery continues, monitoring uncovers more information, and scientists learn more about each species.

Table V-3. Status of Natural Recovery

Population-level Injuries	Expected Recovery	Comments
Harbor seals	Unknown	In decline before the spill. Population may have stabilized.
Sea otters	< 50 years	Population stable, but not recovering
Killer Whales	< 20 years	Recovering
Common murres	< 120 years	Recovery varies by colony.
Marbled murrelet	Maybe stabilize in < 50 years.	In decline before spill. Maybe still declining; maybe stable.
Pigeon Guillemots	Maybe stabilize in < 50 years.	In decline before spill. Probably still declining.
Harlequin ducks	Maybe < 50 years	Still no reproduction within spill area.
Black oystercatchers	< 30 years	Recovering
Sockeye salmon smolts	< 50 years	In Kenai, not yet recovering.
Intertidal organisms	< 25 years	Recovering in most places.
Subtidal organisms	< 10 years in most places.	Recovering in most places.

Sublethal or Chronic Injuries	Expected Recovery of Chronic Injury	Comments
River otters	Unknown	
Bald eagles	Recovered	Back to pre-spill population by 1993-1995
Pink salmon	Unknown	
Pacific herring	Recovered	May know if population declined after 1993 spawning season.
Rockfish	Unknown	
Dolly Varden	< 20 years	
Cutthroat Trout	< 20 years	

Policy variable: Effectiveness of Restoration Actions. Most people would agree that all things being equal, the Trustee should fund the most effective techniques available for restoring oil-spill injuries. However, people may disagree at what level of effectiveness a technique is not worth funding. The Effectiveness of Restoration Actions variable gets at this issue.

The effectiveness of an option is classified into two categories, based on how much change they cause in some aspect of the rate or degree of natural recovery.

- **Most Effective options.** These are the options that have a significant effect on recovery, or make it significantly more likely that the population will achieve its predicted natural recovery. "Most effective" options includes those that agency and peer review scientists estimate could decrease the time to recovery by at least 25%. Options which significantly changed the expected degree of recovery, relative to its prespill condition or its rate of decline were also included in this category.

Many times scientists estimate the time to recovery in a range of years; for example, they might estimate that a population will recovery in, say, 20 to 80 years. Twenty to 80 years forms the confidence interval surrounding recovery. We included options in the "most effective" category, if they decreased the confidence interval by 25%. In this example, that decrease would change the confidence interval to 20-60 years. This is a quantitative way of a scientist saying that the option makes it significantly more likely that an species will achieve its predicted natural recovery.

- **Other Beneficial options.** This category includes options that agency and peer review scientists estimate will have a measurable effect on recovery. It includes those options estimated to cause a 10-24% change in recovery times, including those that change the confidence interval by 10-24%.

Changes less than 10% are unlikely to be measurable. Scientists can rarely measure less than a 10% change in population levels. Options estimated to cause less than a 10% change in recovery (or the confidence interval surrounding recovery) were eliminated from consideration.

In most cases, natural recovery is the most effective mechanism for recovery. Frequently, there is little society can do to help an injured resource or service except wait and protect the injured resources or services from further stress.

The table below shows whether effective options are available to actively aid an injured resource or service recovery, and whether there are options available to protect it from further stress.

Table V-X. Availability of Effective Options

Resources whose populations	Active Restoration		Protection	
declined because of the spill.	Most Eff.	Beneficial	Most Eff.	Beneficial
Harbor seals	No	No	Yes	No
Sea otters	Study*	No	Yes	No
Killer Whales	No	No	Study*	No
Common murres	Yes	Study*	Yes	No
Marbled murrelet	No	No	Yes	No
Pigeon Guillemots	Yes	No	Yes	No
Harlequin ducks	Study*	No	Yes	Yes
Black oystercatchers	No	Study*	No	Yes
Sockeye salmon smolts	Yes	Yes	Yes	Yes
Intertidal organisms	Study*	No	No	No

Subtidal organisms	No	No	No	No

Sublethal or Chronic Effects. No

Detectable spill-related population decline				
River otters	No	No	No	No
Bald eagles	No	No	No	Yes
Pink salmon	Yes	Yes	No	Yes
Pacific herring	No	No	Yes	No
Rockfish	No	No	Yes	No
Dolly Varden	Yes	No	Yes	No
Cutthroat Trout	Yes	No	Yes	No

* Study refers to options that require feasibility studies to fully evaluate them. They include experimental techniques and further analysis to determine whether they can live up to their potential. They are listed under the column in which they would fall if feasibility or further study finds that they are as effective as they promise.

Policy variable: Opportunities for Human Use. Many of the service options, most notably those for recreation or fishing have the objective of improving or increasing opportunities for human use of the spill area as a way to restore or enhance the spill damages. In interviews with spill-area users, many have expressed concern that too much additional use, especially if located inappropriately, might adversely change the character of the area. This variable addresses that this issue. This variable applies only to restoration options for services.

For this criteria, these options are grouped into four categories.

- *Protect existing uses.* Certain options protect existing opportunities for human use of the spill area. They are not designed to increase use levels or change use patterns, but only to protect what existed before the spill. Examples might be funding to state or federal agencies to construct recreation facilities that protect the environment such as outhouses in over-used areas, or improved trails where hiking is damaging wetlands. Other examples include programs to provide information about the safety of subsistence foods to subsistence users.

- *Protect existing or increase existing uses.* Options in this category provide additional opportunity for human use of the spill area. Examples are funding to increase existing sport- or commercial fishing runs, or funding to construct recreation facilities such as public-use cabins that would also increase opportunities for human use.

- *Protect or increase existing uses; or encourage appropriate new uses.* Options in this category take a further step in increasing opportunities for human use of the spill area. They include funding agencies to add new uses in appropriate locations such as visitor centers, new fishing runs, or commercial facilities.

In all of these categories, options would be funded through existing state and federal agencies. Those agencies are required to comply with existing land-use plans, and agency procedures such as those requiring public notice.

OTHER INFORMATION: COST. Cost for each option is shown in 1993 dollars. Payments from Exxon will deposited each year through the year 2001. The 1993-value of the remaining settlement (existing balance plus future deposits) is approximate $522 million. That is an inflation-adjusted amount. The actual amount in current dollars will be ____. Costs are approximate and will change as more is learned about injuries and the options.

Alternative 1 - Natural Recovery

THEME	No action other than monitoring and normal agency management.
VARIABLES	
Injury	N/A
Status of Recovery	N/A
Effectiveness of Restoration Actions	N/A
Opportunities for Human Use	N/A

Monitoring and information programs are included in all alternatives.
Functional equivalents of injured resources and services are included in all alternatives.

What would happen to resources and services within the Exxon Valdez oil spill area if no restoration options were implemented? Normal agency management continues, current trends in human use of the affected area continue, and planned development of private lands continue. These trends influence the environment that injured resources face in order to recover. Ideally, the exact injury would be known, and enough would be known about each resource to develop a population model. Unfortunately, such detailed information is not available for most resources; therefore, estimates are based on discussions with agency experts and peer reviewers, and from experience with similar species in different areas (Note: the literature synthesis information is not yet incorporated into this DRAFT!). Similarly, there is limited information on the injury to services.

The objectives of this alternative are to describe the potential rate and degree of recovery for the injured resources with only normal agency management; identify the missing information that make the recovery estimates uncertain; describe the recovery of services; and to describe the monitoring and public information program that would be funded through the Trustee Council.

I. Monitoring

Monitoring under this alternative is designed to follow the progress of natural (unassisted) recovery of resources and services injured by the oil spill, and to determine when natural recovery has restored injured resources and service to their pre-spill conditions. Implicit in this design is the need to rely as much as possible on normal agency management and monitoring. For example, monitoring the distribution and abundance of harbor seals in Prince William Sound and the Gulf of Alaska, per se, would not be included in the Trustees' monitoring program because the abundance of harbor seals in these waters is already monitored by the National Marine Fisheries Service and the Alaska Department of Fish & Game under provisions of the Marine Mammal Protection Act. However, where designs (goals and objectives) of existing (pre-spill) agency monitoring programs, as in the case of harbor seal, do not adequately address the impacts and recovery dynamics of harbor seals injured by the oil spill, monitoring harbor seal distribution and abundance on or near oiled segments of their range would be included in the Trustees' Natural Recovery Monitoring Program.

Monitoring under this alternative will be conducted on the in surface waters, on tidelands, and on adjacent uplands including their watersheds in Prince William Sound the Gulf of Alaska. Monitoring will continue dependent upon the severity and duration of injuries resulting from the oil spill and the time necessary to establish a trend for recovery.

Resources to be monitored include but are not limited to affected floral (sea grasses and seaweeds) and faunal assemblages (marine mammals, marine birds including sea ducks, fish and shellfish) as well as impacted intertidal and subtidal substrates upon which they depend. Services arising from injured natural resources also will be monitored inclusive of, but not limited to: recreation, subsistence, commercial fishing, wilderness and intrinsic values. Finally, archaeological resources will be monitored.

Costs for monitoring included in this alternative should be modest and should not exceed $2.5 million per year, or $2.0-$3.0 million per year.

II. Information and Education:

Information and education provide the link between restoration activities and knowledge about the effects of those activities. As restoration, or the lack of direct application of restoration tech niques, proceeds and is monitored, the gathering, systematizing, documentation and distribution of information about restoration provides interested persons and communities, scientists, educators, public officials and agencies facts about the effectiveness of techniques and status of recovery for injured resources and services.

Reporting results provides support to education curricula, scientific communities, media, and governmental or private brochures and displays. An Annual Report to the Public (the name only used as an example) would provide in word, graphics and picture information about how much and where money was spent, and what environmental progress, if any, was being made. The information medium would reflect the needs of the various interests. Radio and video shorts, newspaper inserts, books and brochures could all be used. More active methods of information dissemination are meetings and workshops. These media are most effective in rural areas when the information is carried to the people, i.e. town meetings and school workshops.

All methods of information exchange have a means for receiving comment from any interested party. Generally these are clip-out sections of a newspaper, mailers in books and brochures, phone or FAX numbers, and return addresses. For some interested or affected groups such as the Native communities and other subsistence users, visits to their communities, schools and homes for one on one exchanges enhances the credibility of the information and the informer. These intimate interchanges provide both parties a better understanding of interests, needs and reactions to restoration activities.

III. Resources

Natural recovery estimates vary widely for the injured species. For many of the injured species there is not enough information to develop accurate population models that can be used to make predictions. In addition, the recovery of a particular resource is closely dependent on the quality of its habitat and it is difficult to make predictions when future changes to the environment are unknown. Agency scientists and peer reviewers used the best information available to them to predict the potential recovery time. Most gave a range in years that represent possible "best-case" scenarios and "worse-case" scenarios. The wider the span in years, the more uncertainty exists in the expected recovery. For species that were declining prior to the spill even a range in years was impossible. Sometimes it was possible to imagine how long it would take for a population to stabilize, but for most of these species the reason for the decline is unknown and estimates are speculative at best.

A. Marine Mammals

Harbor seals: The harbor seal population in the Gulf of Alaska and Prince William Sound has suffered a severe population decline since the 1970's. The reasons for this decline are unknown, which makes predicting a recovery rate from the effects of the oil spill impossible. The population is expected to continue to decline.

Killer whales - AB pod: As long as there is no additional mortality due to human interactions, the AB pod is expected to fully recover to its pre-spill population level between 10 to 20 years from 1989. The overall whale population is not believed to be injured.

Sea otters: Sea otters are expected to recover 80 - 100% of their pre-spill population. The rate of recovery is dependant on the growth rate of the injured population. Under ideal habitat conditions (abundant high quality food and little competition) sea otters can expand their population at more than 10% per year. Sea otter populations already established in an area probably have a growth rate closer to 2 - 3 % per year. Future habitat conditions and corresponding population growth rates are difficult to predict in the injured area. If the habitat remains degraded the sea otter population may not recover for 35 to 40 years (variation reflects that the population currently may not have a positive growth rate and it may be another 5 years before it begins to grow). If the habitat recovers rapidly to a 'high quality condition', and there are no chronic sublethal effects on the sea otter population, recovery may occur within 7 - 15 years from 1993. (In order to attain this early recovery, the population would have to sustain a

B. Terrestrial Mammals

River otters: River otters are expected to fully recover within 20 years. The injury to river otters is not well understood, therefore it is difficult to make recovery estimates or estimate the effectiveness of different restoration options.

C. Birds

Bald eagles: Bald eagles are expected to be fully recovered to the pre-spill population level between 4 to 6 years after the oil spill (1993 - 1995).

BLACK OYSTERCATCHERS: Natural recovery is expected to occur within the next 30 years. There is a lot of uncertainty regarding the rate of recovery because the actual impact of the injury will not be known until the 1993 breeding season when chicks hatched during 1989 will become sexually mature. It is also unknown how much movement there is between areas so the effect of immigration into the oiled area may greatly accelerate the recovery. The population growth rate for black oystercatchers is unknown; if the growth rate is equal to Eurasian oystercatchers (6.25%) and there are no lingering sublethal effects, the population may recover in 15 years from 1989.

Common murre: The injured common murre populations are expected to return to between 80 to 100% of their pre-spill level. The degree of recovery may vary from pre-spill levels because of natural population fluctuations. The recovery rate for this species is very slow with the predicted recovery time between 50 and 120 years from 1989. These recovery estimates are dependant upon the assumption that commercial fishing doesn't increase near the colonies and that there are no other catastrophic disturbances.

Harlequin ducks are expected to recover to within 80 - 100% (natural variation) of their pre-spill population level. Experts disagreed on the expected recovery time with recovery estimates ranging between 10 and 50 years from 1989.

Marbled murrelets: The marbled murrelet population is not expected to return to pre-spill population levels. The population has been on a long-term decline which is expected to continue. Estimates on when the population may stabilize vary widely between experts. Estimates of further declines range from an additional 20 to 50 % loss with the population stabilizing at that reduced level between 11 and 50 years from now. Because the cause of the pre-spill decline is unknown, it is difficult to estimate stabilization or recovery times.

Pigeon Guillemots: Pigeon guillemots are not expected to return to their pre-spill population levels. The population was declining prior to the spill and the decline is expected to continue. The reasons for the long-term decline are unknown which makes predictions of future population trends extremely difficult. The population is expected to stabilize sometime in the next 50 years, but estimating the population size when it stabilizes is even more uncertain.

D. Fish

Cutthroat trout The injured cutthroat trout population is expected to fully recover to its pre-spill levels in about 13 years (9-19 year range). This is largely due to existing Alaska Department of Fish and Game management which has closed sport-fishing for cutthroat trout in the impacted area.

Dolly Varden trout: The injured dolly varden population is expected to fully recover to its pre-spill levels in about 13 years (9-19 year range). This is largely due to existing Alaska Department of Fish and Game management which has closed sport-fishing in the Prince William Sound impacted area.

Pacific Herring: The complex population dynamics of Pacific herring make it impossible to predict the extent of injury and estimate the natural recovery rate until fish spawned during the oil spill, and subsequent years, return. The effects of the most likely injury scenarios are expected to be recovered within 50 years of 1989, but until the extent of injury is known the uncertainty is extremely wide.

Wild stock Pink salmon: The overall injured population of wild stock pink salmon is expected to recover within 20 years of 1989. While peer reviewers and agency experts expect the population to recover to 100 % of its pre-spill population, it is possible that the wild stocks may be unable to recovery fully. The degree of recovery estimates ranges between 50 and 100%. The lower range estimates represents concern for those streams which are experiencing chronic effects from the oil spill and from the impact of hatchery fish "straying" into wild streams.

Rockfish: There are too many unknowns regarding the injury to rockfish to make predictions around natural recovery.
growth rate higher than 5%/year.)

Sockeye salmon - Kenai river system: Natural recovery of the Kenai river sockeye salmon run is complicated by changes that occurred in the rearing habitat as a result of overescapement. While peer reviewers and agency experts agreed that the population will eventually recover to its pre-spill average, the rate of recovery is more difficult to predict. Recovery rate estimates varied between experts and ranged between 10 to 50 years from 1989 to achieve the 10 year average population size with similar yearly variation. The worst case scenario would occur if two problems developed: the plankton population in the rearing lakes did not recover to the same species composition as before the overescapements; and the salmon population developed a "cyclic abundance" pattern with huge returns some years followed by extremely low runs in other years. The best case scenario could occur if the habitat is recovered by 1993 and there is adequate escapement of spawning adults into the system.

Sockeye Salmon - Kodiak: Natural Recovery of the Kodiak, Red Lake system is expected to be rapid because the overescapement just occurred one year (rather than 1987-1989 for the Kenai system). The injury is expected to produce a one generation effect which means that recovery should occur in 1996, possibly 1997.

E. Coastal Habitat

Coastal Habitat - Upper Intertidal: Natural Recovery of the upper intertidal zone will occur in stages as different species in the community respond to improved environmental conditions. *Fucus* provides food and shelter for many of the invertebrate species that occupy the upper intertidal zone. These species will return after the *Fucus* has recovered. Full recovery of the upper intertidal zone is expected to occur in 8 - 25 years. The wide range is partially due to the ability of *Fucus* to recolonize injured areas. Recovery estimates for the *Fucus* population range from 6 to 15 years. Once *Fucus* begins to recolonize an area it is expected to take a few more years before other to begin to resemble their pre-spill populations.

IV. Services

Much of what is stated for resources is also applicable to injured services. If no restoration options were implemented for these injured services, what would their fate be? Current levels of use or management would continue. Injuries which occurred as a result of direct oiling, cleanup response, and looting or vandalism, as well as to perceptions of despoiled wilderness character would have to be managed by affected agencies. User groups such as commercial and sport fishers and subsistence users would continue to rely upon information produced from monitoring and presented through information and education options. Management and regulation of subsistence uses would continue under current agency jurisdiction.

Archaeologic Sites and Artifacts: Sites and artifacts will not recover from oil damage and depredation. Managers of lands where these sites occur must prevent further site degradation and loss of artifacts and scientific information under current authority and management priority.

Subsistence: Under the Natural Recovery Alternative, no action (restoration) other than normal agency management and monitoring will be conducted. In the case of native communities, normal agency management of the Alaska Department of Fish and Game Subsistence Division includes regulation of bag limits, seasons and other scientifically routine methods to protect wild and renewable resources. These activities are dependent upon monitoring to determine harvest quantities; levels of participation in subsistence activities; where subsistence hunting, fishing, and gathering occurs; the distribution and exchange of subsistence products; methods and means of harvest; and other demographic and economic data.

This alternative will also adress additional monitoring not considered as a normal agency activity prior to the spill. Because of both real and perceived contamination of subsistence foods, there is a need to continue monitoring and chemical analyses of mussels, clams, rockfish, harbor seals and other resources. This monitoring approach is designed to identify traditional subsistence areas still contaminated, measure residual hydrocarbon levels in subsistence foods, as well as restore the confidence of subsistence hunters and fishers in the safety of subsistence resources in the oil spill area.

Recreation and Tourism: Injury to recreation uses occurred throughout the oilspill area. As a result experiences and perceptions changed. Recreation users report less visible oil and a slow, but discernable increase in wildlife sightings. There is also a yearly increase in the number of people using the spill area for recreation activities, although in

1991 activities were still below pre-spill levels. A steady increase in recreation use of the spill area is expected to continue. Annual rates and eventual levels of use by 2001 are unpredictable, as is a date when use will equal or surpass that of 1989.

Wilderness and Intrinsic Values: The uplands of the oil spill area are generally perceived to be of wilderness character. The designated and undesignated Wildernesses have formally recognized this character. Oil found above the mean high tide impacted these areas and perceptably injured the wilderness character of the land. Cleanup and time have removed most visible oil, but the perception of a degraded wilderness resource remains. But visible oil, evidence of damage assessment, and restoration studies are physical reminders of mans' presence and remains a deterent to wilderness experiences by visitors. Oil will disappear in time and managers will provide guidance to field workers to be sensitive to the wilderness character thereby reducing evidence of their presence. The perception that the undeveloped portions of the oil spill area offers visitors an "unspoiled" wilderness experience may never return.

Sport and Commercial Fishing: Closure of commercial fisheries during the spill caused injury to those who relied on this resource for a livelyhood. Current sport fishing closures for cutthroat trout in Western Prince William Sound has resulted from a decline in that species. The current closure will continue until the species recovers. Perceptions of contaminated fish persist. Sport fishing trips to the spill area remain below the pre spill levels. Overescapement of at least two consecutive years' runs of sockeye into the Kenai River system has reduced the food available for fry. Since the adult return from the low years of outmigration will be low, the adults may not be able to produce enough eggs to rebuild the runs within a single generation. If this is the case, adult runs in 1999 and 2000 may also be low. Fluctuations in the number of spawning adults and outmigrating smolts will continue to be monitored by management agencies and regulatory adjustments made to attempt compensatory takes by commercial and sport fishers.

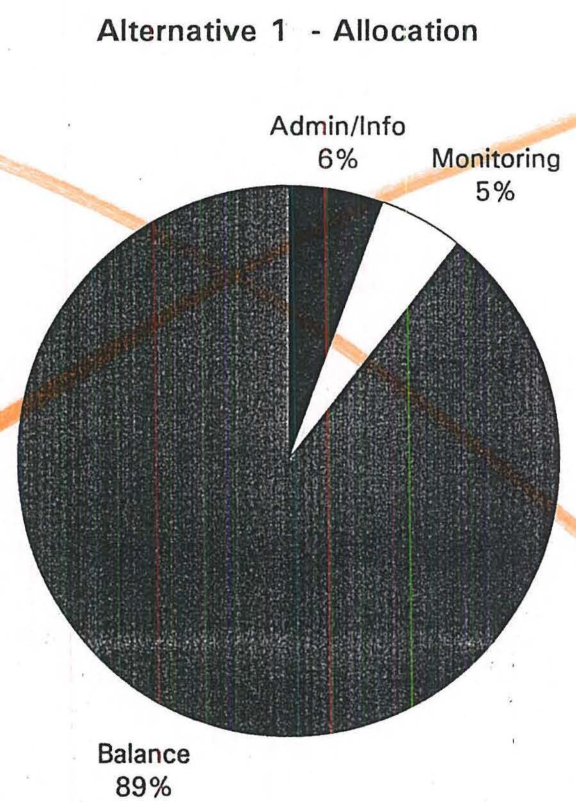
V. COST

Detailed cost estimates for Alternative 1 are contained in Table ___; the allocation of these costs is shown in Figure ___. Estimates of cost are approximate.

The inflation-adjusted value of the remainder of the settlement fund is about $522 million. Monitoring would require about 6% of this amount; and Aministration/Information 5%.

This scenario would leave 89% of the remaining settlement uncommitted. Uncommitted funds could be held for unantipated expenses or an endowment. If the entire balance were invested in an endowment, it would yield about $13 million annually.

Allocation of Remainder of Settlement Funds	Total $	%
Admin/Info	30190.0	6%
Monitoring	25250.0	5%
Balance	466560.0	89%



see brochure

NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

Alternative 1 - Natural Recovery														
				ANNUAL COST			DURATION				TOTAL COST 10-Year Maximum		
								Years					
Opt	DESCRIPTION	ResSvc	UNIT	Exp	Low	High	Type	E	L	H	Expected	Lower	Higher
P1.00	Administration	Multiple resources									30190.0	30180.0	50200.0
P2.00	Monitoring	Multiple resources									25250.0	20250.0	70250.0

NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

Alternative 2 - Protection

THEME	Protect injured resources and services from further degradation or disturbance.
VARIABLES	
Injury	All injured resources.
Status of Recovery	All stages of recovery.
Effectiveness of Restoration Actions	All beneficial actions.
Opportunities for Human Use	N/A

Monitoring and information programs are included in all alternatives.
Functional equivalents of injured resources and services are included in all alternatives.

The goal of this alternative is for the spill-affected area to return to prespill conditions on its own without further disturbance. This alternative addresses all injured resources and services whether or not they have recovered. Table _____ lists the resources and services addressed in this alternative. As these resources and services recover, protective actions would continue so that they are not subject to additional stress.

RESOURCES		SERVICES
Population Decline	**Sublethal/Chronic**	
Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organism Killer whale Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon Subtidal organisms	Bald eagle Cutthroat trout Dolly varden Pacific herring Pink salmon River otter Rockfish	Archaeology Commercial fishing Recreation Sport fishing Subsistence Wilderness

Table _____. Resources and Services Addressed in Alternative 2

Restoration Options. Among the many restoration ideas suggested by scientist, agencies, and the public, only eight meet the criteria for this alternative. There is at least one effective restoration action for each injured resource or service except intertidal organisms, killer whale, pigeon guillemot, sea otter, subtidal orgnisms, Pacific herring, river otter, rockfish, commercial and sport fishing, and subsistence. Many of these restoration options apply to several species. Table ___ lists restoration options by resource or service. These options are presented as potential projects which have already been evaluated; they are not proposals. Over time, other options are likely to be proposed which may be superior to those listed here.

The primary protective measure is Habitat protection and acquisition. In this alternative Habitat protection and acquisition applies to the following resources and services:

Harlequin duck	Bald eagle	Recreation
Marbled murrelet	Cutthroat trout	Wilderness
Sockeye salmon	Dolly varden	
	Pink salmon	

MONITORING

Monitoring under this alternative will focus on the need to evaluate the effectiveness of specific protection measures used in restoring injured resources and services. For example, monitoring of injured resources and services would be conducted in conjunction with establishing special designations such as refuges, sanctuaries, parks and critical areas, purchase and protection of private lands, protection to reduce disturbance around marine bird colonies and marine mammal haulouts, and protection of archaeological sites to deter further degradation of sites and artifacts.

This alternative also includes the provision to determine when natural recovery will restore injured resources and services to their pre-spill conditions. It assumes that normal agency management and monitoring will not be duplicated.

Monitoring under this alternative will be conducted on uplands including their watersheds adjacent to coastal habitat and on tidelands and associated waters impacted by the oil spill. Monitoring will continue dependent upon the severity and duration of injuries resulting form the oil spill and the time necessary to establish a trend for recovery.

Resources to be monitored will include those afforded opportunity to recover on protected uplands, tidal habitats and associated waters inclusive of but not limited to affected floral (sea grasses and seaweeds) and faunal assemblages (marine mammals, marine birds including sea ducks, fish and shellfish) as well as impacted intertidal and subtidal substrate upon which they depend. In the case of services, monitoring would focus on documenting recovery of human-use activities (recreation, subsistence, wilderness perception) associated with protected habitats. Archaeological resources present on protected uplands and tidelands also will be monitored.

Costs associated with monitoring are again modest and should not exceed \$2.5 million per year with a range of \$2.0-\$3.0 million per year. Of the \$2.5 million per year figure, \$1.5 million per year is allotted to monitoring effectiveness of restoration, and \$1.0 million is allotted to monitoring natural recovery.

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatcher	40.0 Special designations
Common murre	4.1 Reduce disturbance at marine bird colonies
Harbor seal	4.2 Reduce disturbance at marine mammal haulouts
Harlequin duck	37.0 Habitat protection and acquisition
Intertidal organisms	None
Killer whale	None
Marbled murrelet	37.0 Habitat protection and acquisition 40.0 Special designations
Pigeon guillemot	None
Sea otter	None
	37.0 Habitat protection and acquisition
Subtidal organisms	None
Bald eagle	37.0 Habitat protection and acquisition
Cutthroat trout	19.0 Anadromous Streams Catalogue 37.0 Habitat protection and acquisition
Dolly varden	19.0 Anadromous Streams Catalogue 37.0 Habitat protection and acquisition
Pacific herring	None
Pink salmon	37.0 Habitat protection and acquisition 40.0 Special designations
River otter	None
Rockfish	None
Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring 10.0 Preserve archaeological sites and artifacts
Commercial fishing	None
	37.0 Habitat protection and acquisition 40.0 Special designations
Sport fishing	None
Subsistence	None
Wilderness	37.0 Habitat protection and acquisition 40.0 Special designations
Multiple resources	44.0 Spill prevention and contingency planning

Table ____. Restoration Options for Alternative 2.

EVALUATION

I. EFFECT ON THE RECOVERY OF RESOURCES

A. MARINE MAMMALS

Harbor seals: Reduce disturbance at marine mammal haulouts (#4) through interagency coordination would help to ensure that harbor seal haulout sites are considered and protected when permitting coastal and marine activities (especially set-net sites) could improve the amount of recovery (if any). Existing disturbance levels within the EVOS area are thought to be minimal but applying this option would provide benefits by preventing additional pup mortality at haulout sites.

Killer whales - AB pod: There are no habitat protection options currently identified that would have notable effects on the AB pod. Although broadly applied protection options such as Special Designations would certainly provide some added protection to the pod.

Sea otters Reduce disturbance at marine mammal haulout and concentration areas (#4.0): There is little information available on how sea otters react to disturbance (such as logging at the head of a highly used bay) so it is difficult to evaluate the ability of this option to prevent habitat degradation. A special study that addresses this problem would provide information on how to implement this option and a land acquisition option to benefit sea otters.

B. TERRESTRIAL MAMMALS

River otters: Habitat protection and acquisition (37.0) provides some protection to the river otter population. No estimates on the amount of habitat that could be protected, or on the tolerance of otters to disturbance are available. Special designations (#40.0): Because we don't know the tolerance of river otters to human activities it is difficult to evaluate this option. Intuitively, we would imagine this option would provide less benefit than acquiring protection on private lands, because there are fewer threats to lands already publicly managed.

C. BIRDS

Bald Eagles: Habitat protection and acquisition (#37) would ensure that the degree of recovery is equal to the pre-spill population level. The bald eagle population in PWS is believed to be at or near the habitat's carrying capacity. Any loss of nesting habitat would likely constitute a corresponding decrease in the population.

BLACK OYSTERCATCHERS: Special designations (#40) that protect areas where black oystercatchers concentrate (usually subadults and failed breeders) or restrict access to injured beaches with several breeding pairs may improve the rate of recovery between 10 to 24 %. Because black oystercatcher habitat is concentrated along the intertidal zone for feeding and breeding little benefit would be added by purchasing upland habitats. There may be a slight (<10%) improvement in the rate of recovery from habitat protection and acquisition in some site specific situations where shoreline activities disturb the nesting birds.

Common murre: Reduce disturbance at marine bird colonies (#4): This option could have a beneficial effect (10 - 24%) on reducing the amount of time to recovery at colonies where human activities disturb the birds during nesting. This option is most likely to have the greatest benefit at the Barrens Islands or Puale Bay. It is thought that the Chiswell Islands colonies have habituated to the tour boats so there would be limited effectiveness at those colonies. Special designations (#40) would provide the same types of protection but cover a larger area.

Harlequin ducks: Habitat protection and acquisition is the single most effective option for ensuring the population can recover to its pre-spill population at the fastest rate. Studies in the Lower 48 have shown that harlequins are easily disturbed by logging, and other human development, and therefore a proportional loss in breeding birds can be expected.

Marbled murrelets: Habitat protection and Acquisition provides the greatest benefit in ensuring that the population can recover and could prevent an even more rapid decline if current prime habitat were developed. It is conceivable that a large portion of the marbled murrelet population could nest in the prime harvestable timber owned privately, but until more is known about nesting habitat it is impossible to estimate the potential impact from logging or other development.

Special designations that include both upland and marine habitats could provide substantial protection to marbled murrelet habitat. A large designation area that would limit development activities and pollution sources may have a positive effect on the prey base. This added protection would also increase the confidence in a more rapid stabilization period. There is wide disagreement between experts on the benefit these designations may provide.

Pigeon Guillemots: Pigeon guillemots are one of the few alcids that appear to be tolerant of human activity near nesting areas, but it is important to protect the nesting sites from erosion and other degradation. Protecting upland habitat immediately adjacent to the coast would prevent the population decline from accelerating due to lost nesting habitat.

D. FISH

Cutthroat trout Update and expand Alaska anadromous stream catalog (#19) will improve the confidence in the population reaching 100% of its pre-spill levels is increased by 10% because there would be a better understanding of the actual population distribution.

Habitat protection and acquisition (37) could prevent substantial losses to the population and therefore affect the degree of recovery. Because PWS cutthroat trout are at the northern extent of their range it is believed that they are more vulnerable to habitat alterations. Large scale development on private lands which would increase the traffic and fishing pressure on nearby populations could cause local (stream-specific) populations to collapse.

Dolly Varden trout Habitat protection and acquisition (37) could prevent a 10 - 20% loss to the population from reduced quality habitat.

Wild stock Pink salmon Habitat protection and acquisition (#37.0) could provide protection to 10 - 30% of the population. This is especially true for areas outside of Prince William Sound where there are more streams with pinks that spawn above the intertidal zone. The added protection may also allow for the population to increase approximately 10% above pre-spill levels.

Special Designations (#40.0): The effectiveness of this option is similar to acquiring private lands. No changes would be seen in the rate or degree of recovery. Special designations which protect the large intertidal spawning areas, and prevent degradation from mining activities, could benefit 10 - 30% of the population.

Sockeye salmon: Habitat protection and acquisition (37.0): The Kenai river system is already protected from most habitat degrading development. This option could be considered to protect the Quartz Creek area from negative impacts caused by widening the Sterling Highway, but would probably have less than a 10% effect on the overall population. For the Red Lake stock, if this option could be applied to protect the watershed that supports the lake.

E. Coastal Habitat

All options that protect coastal areas would benefit the intertidal zones, however, at this time there are no specific protection options targeted at coastal habitat alone.

EFFECT ON THE RECOVERY OF SERVICES

Archaeology. Restoration of archaeological resources cannot regenerate what has been destroyed, but it can successfully address the prevention of further degradation and loss of both sites and the scientific information they contain. Site stewardship program, Site patrol and monitoring, and Preservation of archaeological sites and artifacts are highly effective techniques to protect archaeological resources in the spill-affected area. The last option entails some physical repair and data recovery.

Recreation. Both of the restoration actions included for recreation serve primarily to protect existing uses and their resource base. Habitat protection and Special designations are the primary means of protecting recreation.

Wilderness. Habitat protection amd acquisition is a highly effective means of preventing additional injury to wilderness; Special designations would provide an increased level of resource protection compatible with preservation of wilderness values.

II. MULTI-SPECIES IMPACTS OF PROPOSED OPTIONS

RESOURCE RESTORATION OPTIONS:

The primary focus of this alternative is to implement options which provide protection for the resources and services while they recover. Implementing these protection options for most injured resources helps improve our confidence that the species will be able to recover to their pre-spill levels at the rate described under Natural Recovery. There are a few exceptions where added protection will prevent a disturbance that is known to affect the reproductive productivity of a species. These are described below.

For black oystercatchers Special designations may be used to protect breeding pairs and improve the rate of recovery by 10 to 24% over natural recovery. There may be some slight, but probably less than 10 % improvement from acquiring adjacent uplands.

For common murres reducing disturbance from abrupt loud noises (such as gun shots fired by fishermen to kill large halibut) during breeding could increase the productivity of the nesting colony somewhere between 10 to 24% depending on the current level of disturbance.

For marbled murrelets, experts disagree on the effectiveness of Special designations that cover both upland and marine habitats it is possible that they may have a positive effect on the prey species. This added protection and benefit increases the likelihood that the population could stabilize more rapidly.

Because protective measures would be taken for almost all of the injured resources, this alternative has secondary benefits to a wide variety of other non-injured species.

For services, habitat protection and special designations help to maintain the remote, pristine quality of the oil spill area. As described earlier, these options benefit a wide variety of species and therefore benefit the services which depend upon them.

III. GEOGRAPHIC DISTRIBUTION

Table 3 indicates the part of the spill area where the options will most likely be applied. The areas may change as detailed project planning is completed and as more is learned about injury or recovery.

Options in Alternative #2 focus on protection. Protection is applicable in all parts of the spill area and with some exceptions the options will be applied throughout the spill area. Reducing disturbance at murre colonies will be applied only at the three large colonies in the spill area: Chiswell, Barren Islands, and Paule Bay Colonies. Dolly Varden char and cutthroat trout do not exist in the spill area outside of Prince William Sound. The option locating anadromous streams for those species will be applied only in the Sound.

IV. COST

Detailed cost estimates for Alternative 2 are contained in Table ___; the allocation of these costs is shown in Figure ___. Estimates of cost are approximate. No cost estimates are included for Special designations and Spill prevention and contingency planning because no particular designation is under consideration and spill prevention and contingency planning appears to be well funded at present. However, these situations could change over time. Actual costs will vary as new information about injury becomes available through the monitoring program, new ideas are developed for appropriate restoration options, and project planning proceeds.

The inflation-adjusted value of the remainder of the settlement fund is about $522 million. Two-thirds (67%) of this amount could be set aside for Habitat Protection. Administration/ Information would require 7%; Monitoring 5%; and other restoration projects 2%.

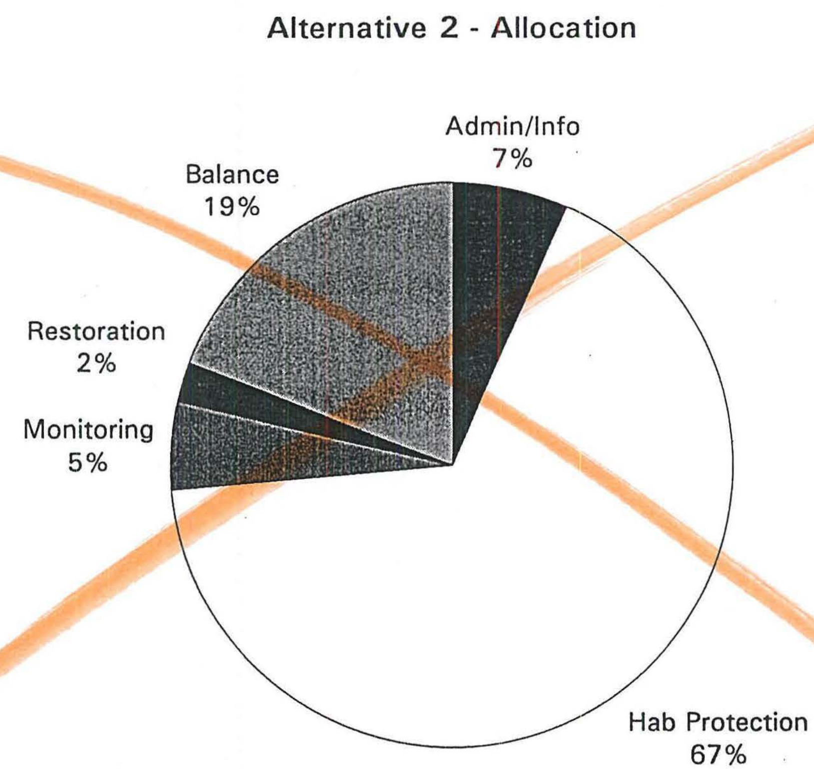
This scenario would leave 19% of the remaining settlement uncommitted. Uncommitted funds could be held for unanticipated expenses, such as injuries identified through the monitoring program, new options, or higher-than-projected costs for those already considered. Another use of the balance could be to fund an endowment for ongoing projects or for a research foundation. If the entire balance were invested in an endowment, it would yield about $2.8 million annually.

RESOURCE OR SERVICE	Opt. No.	OPTION NAME	Options without an alternative	Prince William Sound North	Prince William Sound East	Prince William Sound West	Kenai/Cook Inlet Kenai Ck In	Kenai/Cook Inlet Lower Ck In	Kenai/Cook Inlet Central Ck In	Alaska Penin.	Kodiak/Afog Afg. Shuyak	Kodiak/Afog Kodiak	Outside EVOS
Archaeology	1	Archeological site stewardship program	0	X	X	X	X	X	X	X	X	X	
Common murre	4.1	Reduce disturbance at marine bird colonies	0				X	X	X	X			
Harbor seal	4.2	Reduce disturbance at marine mammal haulout	0	X	X	X	X	X	X				
Archaeology	10	Preserve archaeological sites and artifacts	0	X	X	X	X	X	X	X	X	X	
Cutthroat/Dolly Varden Trout	19	Update anadromous fish stream catalogue	0		X	X							
MULTI-SPECIES	37	Habitat protection and acquisition	0		X	X	X	X	X	X	X	X	
MULTI-SPECIES	40	Special designations	0	X	X	X	X	X	X	X	X	X	
Prevention	44	Spill prevention and contingency plannin	0	X	X	X	X	X	X			X	

~~ALTERNATIVE #2~~

Table X. Expected Geographic Distribution of Options in Alternative #2.

Allocation of Remainder of Settlement Funds		Total $	%
	Admin/Info	35190.0	7%
	Hab Protection	350000.0	67%
	Monitoring	25250.0	5%
	Restoration	12622.0	2%
	Balance	98938.0	19%



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NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

Alternative 2 - Protection														
							DURATION				TOTAL COST		
				ANNUAL COST				Years			10-Year Maximum		
Opt	DESCRIPTION	ResSvc	UNIT	Exp	Low	High	Type	E	L	H	Expected	Lower	Higher
1.10	Site stewardship program	Archaeology	Per 3 areas	195.0	195.0	195.0	Ltd	10	10	10	1950.0	1950.0	1950.0
1.20	Site patrol and monitoring	Archaeology		300.0	300.0	300.0	Ltd	4	3	5	1200.0	900.0	1500.0
4.10	Reduce disturbance	Common murre									330.0	185.0	640.0
4.20	Reduce disturbance	Harbor seal									330.0	185.0	640.0
4.30	Study: Reduce disturbance	Sea otter					Ltd				120.0	80.0	640.0
4.40	Reduce disturb public info	Multiple resources		40.0	30.0	50.0	Ltd	1	1	1	40.0	30.0	50.0
4.50	Reduce disturb field presence	Multiple resources		438.0	390.0	486.0	Ltd	10	10	10	4380.0	3900.0	4860.0
10.00	Archaeol Res Protection	Archaeology									4072.0	3250.0	7000.0
19.10	Anad Stream Catalogue	Cutthroat trout		100.0	100.0	100.0	Ltd	1	1	1	100.0	100.0	100.0
19.30	Anad Stream Catalogue	Pink salmon		100.0	100.0	100.0	Ltd	1	1	1	100.0	100.0	100.0
37.00	Habitat protection/acquisition	Multiple resources									350000.0	225000.0	350000.0
40.00	Special designation	Multiple resources											
44.00	Spill prevention/conting plng	Multiple resources					Ltd						
P1.00	Administration	Multiple resources									35190.0	30180.0	50200.0
P2.00	Monitoring	Multiple resources									25250.0	20250.0	70250.0

NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

Alternative 3 - Limited Restoration

THEME	Take the most effective actions to protect and restore injured services and resources whose population has declined. Maintain the existing character of the affected area.
VARIABLES	
Injury	Injured resources whose populations declined.
Status of Recovery	Resources not yet recovered.
Effectiveness of Restoration Actions	Most effective actions.
Opportunities for Human Use	Protect existing uses.

Monitoring and information programs are included in all alternatives.
Functional equivalents of injured resources and services are included in all alternatives.

The goal of this alternative is for the worst-injured resources and services to return to prespill conditions as efficiently as possible. This is the only alternative that limits its scope to resources whose populations declined after the spill. Table _____ lists the resources and services addressed in this alternative. None of the resources whose populations declined after the spill has yet recovered. However, as resources recover, settlement funds would no longer be allocated to protecting or restoring them. This alternative includes only the most effective actions for protecting injured resources and restoring them to prespill conditions. It also includes only those actions that protect existing human uses that were injured and the resource base on which they depend. For example, a boat ramp in an area already used to launch boats would protect the beach that supports this type of recreational use.

RESOURCES	SERVICES
Black oystercatchers Common murres Harbor seals Harlequin ducks Intertidal organisms Killer whales Marbled murrelet Pigeon guillemots Sea otters Sockeye salmon Subtidal organisms	Archaeology Commercial fishing Recreation Sport fishing Subsistence Wilderness

Table _____. Resources and Services Addressed in Alternative 3

Restoration Options. Among the many restoration ideas suggested by scientist, agencies, and the public, twenty one meet the criteria for this alternative. There is at least one effective restoration action for each injured resource or service except black oystercatchers and subtidal organisms. Table ___ lists restoration options by resource or service. These options are presented as potential projects which have already been evaluated; they are not proposals. Over time, other options are likely to be proposed which may be superior to those listed here.

In this alternative, Transplanting hatchery runs for commercial and sport fishing would continue only until the wild stocks of salmon recover to prespill levels. Testing subsistence foods for hydrocarbon contaimination and providing Access to traditional foods in areas outside the spill-affected area would be continued only until subsistence resources and use return to prespill levels. New backcountry public recreation facilities would be provided only if they protect existing recreational uses and the resource base on which they depend. Facilities that increase use or create a new use would not be supported with settlement funds. Habitat Protection and Acquisition would apply to only the following resources and services:

Harlequin duck	Recreation
Marbled murrelet	Wilderness

MONITORING

Monitoring under this alternative will focus on the need to evaluate the effectiveness of restoration options used in combination including those designed to manage human use, to directly manipulate injured resources and services, to protect or acquire critical habitat, and to replace or acquire the equivalent of injured resources and services. Monitoring of this type is designed to identify where additional restoration activities may be appropriate, and determine when injury is delayed.

For those resources where little can be done to accelerate recovery, e.g., sea otter, Alternative 3 includes provision to monitor natural recovery. Also, Alternative 3 assumes that normal agency management and monitoring will not be duplicated.

However, monitoring will only be conducted for those resources injured at the population level, and only in conjunction with those restoration measures that are likely to be the most effective when implemented. Monitoring for services will apply only to those options designed to protect and restore existing services injured by the oil spill.

Monitoring will be conducted on and in surface waters, tidelands, and on adjacent uplands including their watersheds in Prince William Sound and the Gulf of alaska. Monitoring also will be conducted outside the spill affected area to measure the effectiveness of replacement and acquisition of equivalent resources and services options, e.g., eliminate predators from marine bird colonies in the Aleutian Islands, included in this

RESOURCE/SERVICE	RESTORATION OPTION
Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring 10.0 Preserve archaeological sites and artifacts
Black oystercatchers	None
Common murres	16.1 Study: Social stimuli 17.2 Reduce predator access
Harbor seals	46.0 Cooperative program - fishers 47.0 Cooperative program - subsistence users
Harlequin duck	13.0 Eliminate oil from mussel beds 37.0 Habitat protection and acquisition
Intertidal organisms	14.0 Accelerate recovery - upper intertidal
Killer whales	45.0 Study: Changes in black cod fishery gear
Marbled murrelet	9.0 Minimize incidental take 37.0 Habitat protection and acquisition 40.0 Special designations
Pigeon guillemots	17.2 Reduce predator access
Sea otters	4.2 Study: Reduce disturbance 13.0 Eliminate oil from mussel beds 47.0 Cooperative program - subsistence users
Sockeye salmon	2.5 Intensify management 48.2 Improve survival rates
Subtidal organisms	None
Commercial fishing	18.0 Replace salmon harvest opportunities
Recreation	12.1 New backcountry public recreation facilities 37.0 Habitat protection and acquisition 40.0 Special designations
Sport fishing	18.0 Replace salmon harvest opportunities
Subsistence	30.0 Test subsistence foods 49.0 Access to traditional foods
Wilderness	37.0 Habitat protection and acquisition 40.0 Special designations
Multiple resources	44.0 Spill prevention and contingency planning

Table ____. Restoration Options for Alternative 3.

alternative. Monitoring will continue dependent on the severity and duration of effects resulting form the spill and the time necessary to establish a trend for recovery.

Resources to be monitored include but are not restricted to affected floral (sea grasses and seaweeds) and faunal assemblages (marine mammals, marine birds including sea ducks, etc.

Costs of Alternative 3 will be $4.0 million per year with a range of $3.5 to $4.5 million per year. Of the $4.0 million per year figure, $3.0 million per year is allotted to monitoring effectiveness of restoration, and $1.0 million per year is allotted for monitoring natural recovery.

EVALUATION

I. EFFECT ON RECOVERY

All of the restoration actions in this alternative are expected to improve the rate or degree of recovery by 25% to over 50% over natural recovery. However, the objective of this alternative is to protect as well as to restore. Consequently, some restoration actions were included not because they accelerate recovery but because they protect injured resources or services from further degradation or decline.

Restoration actions whose primary purpose is to protect injured resources and services are:

- 1.1 Archaeological site stewardship program
- 1.2 Archaeological site patrol and monitoring
- 10.0 Preserve archaeological sites and artifacts
- 12.1 New backcountry public recreation facilities to protect existing uses or their resource base
- 37.0 Habitat protection/acquisition
- 40.0 Special designations
- 44.0 Spill prevention and contingency planning

The effect these options have on recovery is to prevent further stress to resources and services, thereby allowing natural recovery processes to work more efficiently.

The effect of other restoration actions on recovery are described below by resource or service.

EFFECT ON THE RECOVERY OF RESOURCES

A. MARINE MAMMALS

Harbor seals: The two options which have the greatest potential to benefit harbor seals are both cooperative programs which will help provide greater management by coordinating the groups that have the most interaction with the harbor seal population. These groups include managers, researchers, subsistence users and commercial fishermen. The two options are: Develop a cooperative program with subsistence users, and Develop a cooperative program with commercial fishermen.

Killer whales - AB pod: The AB pod feeds in the area where the Prince William Sound black cod fishery occurs. In the past there have been conflicts with the killer whales marauding the fishermens' catch. An option to coordinate, and compensate, fishermen to Facilitate gear changes in the black cod fishery from long-lines to pots, would prevent the whales from marauding the catch and eliminate the need for fishermen to defend their harvest.

Sea otters: The option believed to have the greatest ability to effect the overall sea otter population is to Develop a cooperative program with subsistence users. This option would help ensure that the sea other population fully recovers to its pre-spill level and sustain any changes in harvest levels.

The special study of Eliminating oil from oiled mussel beds could be highly effective (25% to over 50%) in improving the weanling pups survival and recruitment rates. This option has to be considered as a special study because there are too many unknown factors that influence the potential effectiveness of this option. The current level of exposure of young otters to oil from oiled mussel beds is not known, nor is there information on how much oiled food can be eaten before the toxin levels cause an adverse effect. Without this information this option cannot be adequately evaluated.

B. BIRDS

BLACK OYSTERCATCHERS: None of the current options proposed for black oystercatchers are expected to reach the effectiveness level required for this alternative.

Common murres: At this time, there are no proposed options which are certain to reach the effectiveness level required for this alternative. There are two options which have the potential to greatly influence the rate of recovery for common murres; however, preliminary work would need to be completed before the effectiveness can be adequately evaluated. These options are: (#16.1) Enhancing the social stimuli, and (#17.2) Predator control to benefit marine birds.

Enhancing social stimuli may accelerate the rate of recovery by reducing the number of years for the population to return to synchronized and successful breeding. Using social stimuli to encourage synchronization is an experimental technique.

The level of predation, and its impact, on the injured colonies has not been documented. If it is shown to be a significant problem (At some colonies predation has been shown to destroy 50% of the eggs.), then this option could greatly affect the breeding success of the colonies.

Harlequin ducks: Protecting nesting habitat (#37 Habitat protection and acquisition) for harlequin ducks is the most effective technique currently proposed. While it will not improve the rate or degree of recovery, it can prevent habitat loss which could prevent the population from fully recovering to its prespill level.

Eliminating oil from oiled mussel beds (#13) has the potential to improve the rate of recovery of a localized area by 25 - 50%; however, at this time there are too many unknowns to be certain of its effectiveness, therefore this would be considered as a Special study.

Marbled murrelets: Protecting habitat (options #37 Habitat protection and acquisition and #40 Special designations) would ensure that the marbled murrelet population could recover to is prespill levels once the population decline is reversed. Protecting the coastal waters could also benefit their prey which may help stabilize the population more quickly. In localized areas, option #9 Minimizing incidental take of marine birds could provide additional help to stabilize the population.

Pigeon guillemots: The only option currently proposed that has the potential to produce a substantial impact on stabilizing the population needs to have preliminary work completed before the option can be adequately evaluated. Option #17.2 Predator control to benefit marine birds has the potential to increase productivity by 25-50 % at very site specific locations; however, predation levels at colonies within the injured area have not been documented and this option may not be needed should predation levels be low.

C. FISH

Sockeye salmon (Kenai River): Option 2 Intensify fisheries management to protect injured stocks is the single most effective option for aiding and protecting the Kenai river systems. Its primary benefit is in the ability to prevent future overescapement problems which could greatly exacerbate the current injury level. With this option the risk of overescapements could be reduced from 25% to 10%.

In combination with the above option, and under the right environmental conditions, option #48 (Improve the survival of salmon eggs to fry) could be very effective for the Kenai river system. Improving survival of salmon eggs to fry could stimulate recovery so the injury is confined to one generation and recovery is complete around the year 2000. In order to implement this option monitoring of the plankton population and salmon escapement must occur in 1994/95 in order to supplement fry production in 1995.

D. COASTAL HABITAT

Coastal habitat - subtidal: At this time, no effective options have been identified that could help the recovery of subtidal organisms.

Coastal habitat - upper intertidal: Option 14 - Accelerate the recovery of the upper intertidal zone may prove to greatly increase the recovery time on a very localized basis. Experts have estimated that the option could increase the rate of recovery by 25 to 50%; however, the techniques are experimental and are not likely to be applied on a broad scale.

EFFECT ON THE RECOVERY OF SERVICES

Archaeology. Restoration of archaeological resources cannot regenerate what has been destroyed, but it can successfully address the prevention of further degradation and loss of both sites and the scientific information they contain. Site stewardship program, Site patrol and monitoring, and Preservation of archaeological sites and artifacts are highly effective techniques to protect archaeological resources in the spill-affected area. The last option entails some physical repair and data recovery.

Commercial Fishing. Replacing harvest opportunities by creating new hatchery runs is a highly effective method of replacing commercial fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Recreation. All three of the restoration actions included for recreation serve primarily to protect existing uses and their resource base. Habitat protection and Special designations are the primary means of protecting recreation. However, in limited situations New backcountry public recreation facilities could protect both recreation and the resources on which it depends by, for example, providing an outhouse in a heavily used area.

Sport fishing. Replacing harvest opportunities by creating new hatchery runs is a highly effective method of replacing sport fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Subsistence. Testing subsistence foods is expected to be an effective way of restoring confidence in the safety of subsistence resources withing the spill area. Concern over the safety of subsistence resources is believed to be one of the reasons subsistence harvests have not yet returned to pre-spill levels. Providing Access to traditional foods in areas outside the spill-affected area would be a highly effective way of restoring lost use. Both projects would be continued until subsistence resources and use have recovered to pre-spill levels.

Wilderness. Habitat protection amd acquisition is a highly effective means of preventing additional injury to wilderness; Special designations would provide an increased level of resource protection compatible with preservation of wilderness values.

II. MULTI-SPECIES IMPACTS OF PROPOSED OPTIONS

Ecosystem Effects. Of the twenty-three restoration options included in this alternative, six benefit multiple resources. They are:

13.0 Eliminate oil from mussel beds
14.0 Accelerate recovery of upper intertidal zone
37.0 Habitat protection and acquisition
40.0 Special designations
44.0 Spill prevention and contingency planning
48.2 Improve survival rates of sockeye salmon

The resources these restoration options benefit may include resources injured at a sublethal or chronic level and therefore not directly addressed in this alternative.

The remaining seventeen restoration options focus on individual species. However, even these actions are expected to benefit services such as subsistence and recreation.

RESOURCE RESTORATION OPTIONS:

Of the 14 resource restoration options identified in Alternative 3, 6 of them could potentially have significant multiple-species and habitat benefits.

Habitat protection and acquisition targeted at harlequin ducks would protect the riparian zone and nearby uplands adjacent to anadromous streams. Protection of these areas will have far reaching effects on other resources that depend on the riparian zone and on the anadromous fish. Protection for marbled murrelets would include more upland, non-riparian, habitat and would provide even greater protection for wildlife species that have large home ranges. Some of the other species that would benefit from implementing these options are: Sitka black-tailed deer; brown bears, black bears, river otters, bald eagles, and anadromous fish. Special designations for marbled murrelets would benefit terrestrial species utilizing old growth forests.

For pigeon guillemots and common murres it is possible that reducing predators near nesting colonies would be very effective in helping the colonies recover. If it is determined that predation is a serious problem at injured colonies then implementation of this option could be considered. This option would also benefit other species that are preyed upon by the gulls and weasels. Even though implementing this option for either murres or guillemots would not have a long-term effect on the predator population there is obviously a negative ecological cost to the predators. Therefore, the ecological costs and benefits will be carefully weighed to determine if the option should be implemented.

There were no options identified that would have the effectiveness level required in this alternative that would benefit black oystercatchers; however, if habitat protection were extended to the coastline, black oystercatcher and pigeon guillemot habitat would be protected. In addition, two of the special studies could benefit black oystercatchers if implemented in areas which are have, or had, high use.

These special study options include eliminating oil from oiled mussel beds and accelerating the upper intertidal. Both of these options affect lower levels of the food chain which can benefit many species. For instance, accelerating the growth rate of the seaweed *Fucus* would accelerate the colonization of invertebrates such as limpets. Limpets are one of the main prey species for black oystercatchers whose eggs and chicks are preyed upon by gulls, ravens, and some mammalian predators. Limpets and other small invertebrates are consumed by other species which are then taken by birds, river otters, etc. Although both of these special study options have effects on many species, they are not likely to be applied on a broad scale to benefit more than a localized area.

Improving survival rates of juvenile sockeye salmon could benefit marine and terrestrial predators which feed on salmon eggs, juvenile and adults. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. However, the option needs to be carefully implemented so as not to exceed the carrying capacity of the ecosystem by producing large numbers of new fish.

SERVICE RESTORATION OPTIONS

Of the 9 service restoration options proposed for Alternative 3, 5 of them have potential impacts on multiple species and habitats.
Building new backcountry, public recreation facilities has potential negative impacts on all species if facilities are sited so as to increase human use of damaged habitats or other areas supporting recovering species. Alternatively, properly sited facilities could 'harden' use areas and direct uses away from injured areas and promote undisturbed natural recovery of injured resources.

Habitat acquisition and special designations for recreational purposes could benefit injured resources by protecting them from development and disturbances incompatible with recreation. On the other hand, these options could, if not carefully implemented, increase human use of damaged areas and slow natural recovery rates.

Spill prevention and contingency planning could benefit all species by preventing additional spills which would further compound existing injuries.

Replacing harvest opportunities by creating new salmon runs would benefit commercial and sport fishermen. Positive multi-species impacts would result from benefits to the many species which prey on salmon adults, eggs and juveniles. Benefits would be higher in the case of stream stocking programs, since eggs, juveniles and adult would be available to marine and terrestrial predators. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. Terminal hatchery runs would provide fewer species with prey, since only adults and juveniles would be available to marine predators.

Negative impacts include the possibility of increasing mortality of seabirds and marine mammals due to interactions
with new commercial fisheries. Also, wild-stock pink salmon could possibly be impacted by fish from new runs straying into wild streams. Lastly, new runs stocked into streams which did not previously support salmon might harm resident fish through competition for food and spawning habitat.

Archaeology. Restoration of archaeological resources cannot regenerate what has been destroyed, but it can successfully address the prevention of further degradation and loss of both sites and the scientific information they contain. Site stewardship program, Site patrol and monitoring, and Preservation of archaeological sites and artifacts are highly effective techniques to protect archaeological resources in the spill-affected area. The last option entails some physical repair and data recovery.

Commercial Fishing. Creating new Terminal hatchery runs is a highly effective method of replacing commercial fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Recreation. All three of the restoration actions included for recreation serve primarily to protect existing uses and their resource base. Habitat protection and Special designations are the primary means of protecting recreation. However, in limited situations New backcountry public recreation facilities could protect both recreation and the resources on which it depends by, for example, providing an outhouse in a heavily used area.

Sport fishing. Transplanting hatchery runs is a highly effective method of replacing sport fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Subsistence. Testing subsistence foods is expected to be an effective way of restoring confidence in the safety of subsistence resources withing the spill area. Concern over the safety of subsistence resources is believed to be one of the reasons subsistence harvests have not yet returned to pre-spill levels. Providing Access to traditional foods in areas outside the spill-affected area would be a highly effective way of restoring lost use. Both projects would be continued until subsistence resources and use have recovered to pre-spill levels.

Wilderness. Habitat protection amd acquisition is a highly effective means of preventing additional injury to wilderness; Special designations would provide an increased level of resource protection compatible with preservation of wilderness values.

III. GEOGRAPHIC DISTRIBUTION

Table 3 indicates the part of the spill area where the options will most likely be applied. The areas may change as detailed project planning is completed and as more is learned about injury or recovery.

Most protective options are applied throughout the spill area. But some research and restoration options are not applicable in all regions. With two exceptions, subsistence options and most commercial fishing options are applied in Prince William Sound and Kodiak. The exceptions are: feasibility study of Black Cod fishing interactions with Killer whales (Prince William Sound, where the interactions are expected to occur); Intensify pink salmon management to protect injured stocks (PWS), and Improve survival rates of salmon and eggs (Red Lake on Kodiak.)

IV. COST

Detailed cost estimates for Alternative 3 are contained in Table ___; the allocation of these costs is shown in Figure ___. Estimates of cost are approximate. No cost estimates are included for Special designations and Spill prevention and contingency planning because no particular designation is under consideration and spill prevention and contingency planning appears to be well funded at present. However, these situations may change over time. Actual costs will vary as new information about injury becomes available through the monitoring program, new ideas are developed for appropriate restoration options, and project planning proceeds.

The inflation-adjusted value of the remainder of the settlement fund is about $522 million. Sixty-two percent (62%) of this amount could be set aside for Habitat Protection. Monitoring and Administration/Information would require about 8% each. Other Restoration actions would require slightly less than 5%.

This scenario would leave 19% of the remaining settlement uncommitted. Uncommitted funds could be held for unanticipated expenses, such as injuries identified through the monitoring program, new options, or higher-than-projected costs for those already

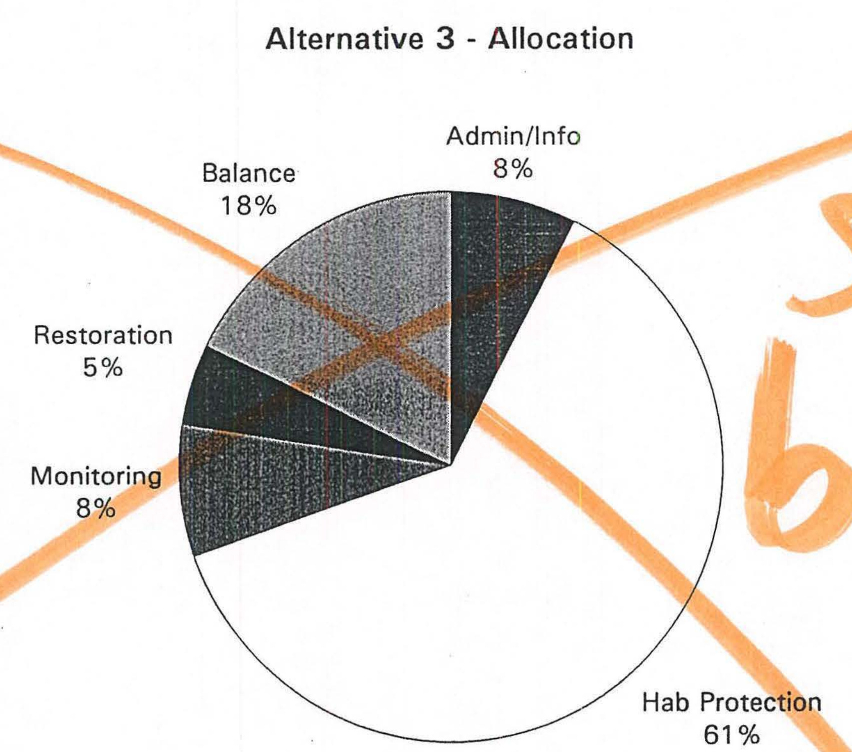
RESOURCE OR SERVICE	Opt. No.	OPTION NAME	Prince William Sound North	Prince William Sound East	Prince William Sound West	Kenai/Cook Inlet Kenai Ck In	Kenai/Cook Inlet Lower Ck In	Kenai/Cook Inlet Central Ck In	Alaska Penin.	Kodiak/Afog Afg. Shuyak	Kodiak/Afog Kodiak	Outside EVOS
Archaeology	1	Archeological site stewardship program	X	X	X	X	X	X	X	X	X	
Pink salmon	2.3	Intensify pink salmon mgmt to protect inj stocks	X	X	X							
Sockeye salmon	2.5	Intensify sockeye mgmt to protect inj stocks										
Marbled murrelet	9	Minimize incidental take by comm fish	X	X	X	X	X	X	X	X	X	
Archaeology	10	Preserve archaeological sites and artifacts	X	X	X	X	X	X	X	X	X	
Harlequin duck	13	Eliminate oil from mussel beds			X	X	X	X	X	X	X	
Upper intertidal	14	Accelerate recovery of upper intertidal zone			X	X	X	X	X	X	X	
Pigeon guillemot	17.2	Reduce predator access (Pigeon Guillemot)	X	X	X	X	X	X	X	X	X	
Comm'l & Sport Fishing	18	Replace salmon harvest opportunities	X	X	X						X	
Subsistence	30	Test subsistence foods for oil contamination		X	X						X	
MULTI-SPECIES	37	Habitat protection and acquisition		X	X	X	X	X	X	X	X	
MULTI-SPECIES	40	Special designations	X	X	X	X	X	X	X	X	X	
Prevention	44	Spill prevention and contingency plannin	X	X	X	X	X	X			X	
Killer Whale - AB pod	45	Black cod fishery, feas stdy	X	X	X							
Harbor seal	46	Cooperative program with fishermen	X	X	X							
Harbor Seal & Sea otter	47	Cooperative program with subsistence users		X	X						X	
Sockeye salmon	48	Improve survaval rates of salmon eggs & juv.								X	X	
Subsistence	49	Provide subsistence users access		X	X						X	

Table X. Expected Geographic ~~Alternative #3~~ Distribution of Options in Alternative #3 considered. Another use of the balance could be to fund an endowment for ongoing projects or for a research foundation. If the entire balance were invested in an endowment it would yield about $2.6 million annually.

V. PRIORITY

Because Alternative 3 addresses more severely injured resources, includes the most effective restoration actions, and few restoration options were identified for each resource or service, there is no proposal for setting priorities. However, if environmental conditions on the Kenai river system are adequate to support a supplemental fry program then Option 2.0 and 48.0 must be in place in 1994.

Allocation of Remainder of Settlement Funds	Total $	%
Admin/Info	40190.0	8%
Hab Protection	325000.0	62%
Monitoring	40250.0	8%
Restoration	24742.0	5%
Balance	91818.0	18%



see brochure

NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

Alternative 3 - Limited Restoration

Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION				TOTAL COST 10-Year Maximum		
								Years					
				Exp	Low	High	Type	E	L	H	Expected	Lower	Higher
1.10	Site stewardship program	Archaeology	Per 3 areas	195.0	195.0	195.0	Ltd	10	10	10	1950.0	1950.0	1950.0
1.20	Site patrol and monitoring	Archaeology		300.0	300.0	300.0	Ltd	4	3	5	1200.0	900.0	1500.0
2.50	Intensify management	Sockeye salmon		750.0	700.0	800.0	Ltd	5	2	5	3750.0	1400.0	4000.0
4.30	Study: Reduce disturbance	Sea otter					Ltd				120.0	80.0	640.0
9.00	Minimize incidental take	Marbled murrelet									1625.0	1100.0	2000.0
10.00	Archaeol Res Protection	Archaeology									4072.0	3250.0	7000.0
12.10	New backcountry rec facilities	Recreation									1620.0	480.0	3256.0
13.10	Eliminate oil from mussel beds	Harlequin duck		491.0	340.0	641.0	Ltd	5	4	7	2455.0	1360.0	4487.0
13.20	Study: Elim oil fr mussel beds	Sea otter											
14.10	Accelerate recovery of UIT	Intertidal organisms		150.0	100.0	200.0	UR	5	4	7	750.0	400.0	1400.0
16.10	Study: Social stimuli	Common murre					Ltd				850.0	800.0	5500.0
17.21	Reduce predator access	Common murres		350.0	300.0	400.0	Ltd	5	5	10	1750.0	1500.0	4000.0
17.22	Reduce predator access	Pigeon guillemot		200.0	150.0	250.0	Ltd	4	4	6	800.0	600.0	1500.0
18.10	Replace harvest opportunities	Comm fishing	Per run	150.0	100.0	200.0	Ltd	2	1	5	300.0	100.0	1000.0
18.20	Replace harvest opportunities	Sport fishing	Per run	150.0	50.0	200.0	Ltd	2	1	5	300.0	50.0	1000.0
30.00	Test subsistence foods	Subsistence		330.0	300.0	350.0	Ltd	3	2	5	990.0	600.0	1750.0
37.00	Habitat protection/acquisition	Multiple resources									325000.0	225000.0	350000.0
40.00	Special designation	Multiple resources											
44.00	Spill prevention/conting plng	Multiple resources					Ltd						
45.00	Study: Changes in black cod	Killer whale		30.0	30.0	30.0	Ltd	1	1	1	30.0	30.0	30.0
46.00	Coop prgm-fishermen	Harbor seal		50.0	30.0	100.0	Ltd	3	1	5	150.0	30.0	500.0
47.10	Coop prgm-subsistence users	Harbor seal		30.0	30.0	30.0	UR	10	10	10	300.0	300.0	300.0
47.10	Coop prgm-subsistence users	Sea otter					UR						
48.20	Improve survival rates	Sockeye salmon	Per run	400.0	200.0	600.0	Ltd	3	1	5	1200.0	200.0	3000.0
49.00	Access to traditional foods	Subsistence		53.0	50.0	60.0	UR	10	10	10	530.0	500.0	600.0
P1.00	Administration	Multiple resources									40190.0	30180.0	50200.0
P2.00	Monitoring	Multiple resources									40250.0	20250.0	70250.0

NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

Alternative 4 - Moderate Restoration

THEME	Take the most effective actions to protect and restore all injured resources and services. Increase, to a limited extent, opportunities for human use in the affected area.
VARIABLES	
Injury	All injured resources.
Status of Recovery	Resources not yet recovered.
Effectiveness of Restoration Actions	Most effective actions.
Opportunities for Human Use	Protect or increase existing uses.

Monitoring and information programs are included in all alternatives.
Functional equivalents of injured resources and services are included in all alternatives.

The goal of this alternative is for all injured resources and services to return to prespill conditions as efficiently as possible. Table _____ lists the resources and services addressed in this alternative. None of the resources whose populations declined after the spill has yet recovered. However, as resources recover, settlement funds would no longer be allocated to protecting or restoring them. This alternative includes actions that protect existing human uses that were injured and the resource base on which they depend and also those actions that would increase existing use. An example of the latter is a new hatchery run that may increase fishing opportunities but is compatible with existing use.

RESOURCES		SERVICES
Population Decline	Sublethal/Chronic	
Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organism Killer whale Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon Subtidal organisms	Bald eagle Cutthroat trout Dolly varden Pacific herring Pink salmon River otter Rockfish	Archaeology Commercial fishing Recreation Sport fishing Subsistence Wilderness

Table _____. Resources and Services Addressed in Alternative 4.

Restoration Options. Among the many restoration ideas suggested by scientist, agencies, and the public, 28 meet the criteria for this alternative. Of these, 21 are identical to those in Alternative 3. There is at least one effective restoration action for each injured resource or service except black oystercatchers, subtidal organisms and river otter. Table ___ lists restoration options by resource or service. These options are presented as potential projects which have already been evaluated; they are not proposals. Over time, other options are likely to be proposed which may be superior to those listed here.

In this alternative, as for Alternative 3, Transplanting hatchery runs for commercial and sport fishing would continue only until the wild stocks of salmon recover to prespill levels. Testing subsistence foods for hydrocarbon contaimination and providing Access to traditional foods in areas outside the spill-affected area would be continued only until subsistence resources and use return to prespill levels. However, in contrast to Alternative 3 New backcountry public recreation facilities would be provided either to protect or increase existing recreational uses. Habitat Protection and Acquisition would apply to only the following resources and services:

Harlequin duck	Bald eagle	Recreation
Marbled murrelet	Cutthroat trout	Wilderness
	Dolly varden	

MONITORING

Monitoring under this alternative will be conducted to evaluate the effectiveness of restoration options used in combination inclusive of managing human use, directly manipulating resources and services, protecting or acquiring critical habitat, and replacing or acquiring the equivalent of injured resources and services. Monitoring of this type is designed to identify where additional restoration activities may be appropriate, and determine when injury is delayed.

This alternative also includes the provision to monitor the dynamics of other ecological components, e.g., those important in the food chain (web) of injured species. This type of monitoring is useful in detecting residual effects of the oil spill many years removed from the event, and it provides a baseline from which to assess impacts of future spills and other disturbance. It also generates a database that facilitates greater understanding of how our changing environment affects the species that we manage and protect.

For those resources or services where little can be done to accelerate their recovery, e.g., sea otter, Alternative 4 includes provision to determine when natural recovery will restore injured resources and services to their pre-spill conditions. It also is assumed that normal agency management and monitoring will not be duplicated.

Under this alternative, monitoring will be conducted for all injured resources and services, but particularly in conjunction with restoration options that are likely to be the most effective when implemented. Monitoring recovery of injured services will be undertaken in association with restoration measures designed to protect, restore and to increase (enhance) existing human-use activities

Monitoring will be conducted on and in surface waters, on tidelands, and on adjacent uplands including their watersheds in Prince William Sound and the Gulf of Alaska. Monitoring also will be conducted outside the spill affected area to measure the effectiveness of replacement or acquisition of equivalent resources and services options, e.g., eliminate predators of marine birds on Aleutian Islands, included in this alternative. Monitoring will continue dependent upon the severity and duration of effects resulting from the spill and the time necessary to establish a trend for recovery. Some monitoring components, e.g. those designed to document long-term trends in the health of the ecosystem, could continue in perpetuity if supported by an endowment.

Resources to be monitored include but are not restricted to affected floral (sea grasses and sea weeds) and faunal assemblages (marine mammals, marine birds including sea ducks, etc. <u>See Alternative 1 for complete list of injured resources and services to be monitored.</u>

<u>Costs for Alternative 4 are $5.0 million per year with a range of $4.0-$5.0 million per year. Of the $5.0 million per year figure, $3.0 million per year is allotted to monitoring effectiveness of restoration; $1.0 million per year is allotted to monitoring natural recovery; and $1.0 million per year is allotted for monitoring long-term trends in the health of the ecosystem.</u>

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatcher	None
Common murre	16.1 Study: Social stimuli 17.2 Reduce predator access
Harbor seal	46.0 Cooperative program - fishers 47.0 Cooperative program - subsistence users
Harlequin duck	13.0 Eliminate oil from mussel beds 37.0 Habitat protection and acquisition
Intertidal organisms	14.0 Accelerate recovery - upper intertidal
Killer whale	45.0 Study: Changes in black cod fishery gear
Marbled murrelet	9.0 Minimize incidental take 37.0 Habitat protection and acquisition 40.0 Special designations
Pigeon guillemot	17.2 Reduce predator access
Sea otter	4.2 Study: Reduce disturbance 13.0 Eliminate oil from mussel beds 47.0 Cooperative program - subsistence users
Sockeye salmon	2.5 Intensify management 48.2 Improve survival rates
Subtidal organisms	None
Bald eagle	37.0 Habitat protection and acquisition
Cutthroat trout	2.1 Intensify management 37.0 Habitat protection and acquisition
Dolly varden	2.1 Intensify management 37.0 Habitat protection and acquisition
Pacific herring	2.2 Intensify management
Pink salmon	2.3 Intensify management 51.0 Relocate existing hatchery runs
River otter	None
Rockfish	2.4 Intensify management
Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring 10.0 Preserve archaeological sites and artifacts 35.0 Acquire replacements for artifacts from the spill area
Commercial fishing	11.2 Fertilize lakes to improve sockeye salmon rearing success 18.0 Replace salmon harvest opportunities

Recreation	12.1 New backcountry public recreation facilities 37.0 Habitat protection and acquisition 40.0 Special designations
Sport fishing	11.2 Fertilize lakes to improve sockeye salmon rearing success 18.0 Replace salmon harvest opportunities
Subsistence	30.0 Test subsistence foods 49.0 Access to traditional foods
Wilderness	37.0 Habitat protection and acquisition 40.0 Special designations
Multiple resources	44.0 Spill prevention and contingency planning

Table ____. Restoration Options for Alternative 4.

EVALUATION

I. EFFECT ON THE RECOVERY OF RESOURCES

A. Marine mammals

Harbor seals: The two options which have the greatest potential to benefit harbor seals are: Develop a cooperative program with subsistence users, and Develop a cooperative program with commercial fishermen. These programs which will help provide greater management by coordinating managers, researchers, subsistence users and commercial fishermen.

Killer whales - AB pod: An option to determine the feasibility of facilitating gear changes in the black cod fishery from long-lines to pots, would prevent the whales from marauding the catch and eliminate the need for fishermen to defend their harvest.

Sea otters: The option believed to have the greatest ability to effect the overall sea otter population is to Develop a cooperative program with subsistence users. This option would help ensure that the sea other population fully recovers to its pre-spill level and sustain any changes in harvest levels. In addition, the special study of Eliminating oil from oiled mussel beds could be highly effective (25% to over 50%) in improving the weanling pups survival and recruitment rates if oiled mussel beds are determined to be a major reason for the poor weanling survival.

B. Terrestrial mammals

River otters: There are no proposed options that meet the effectiveness level described for this option.

C. Birds

Bald eagles: None of the current options proposed for bald eagles are expected to reach the effectiveness level required for this alternative.

Black oystercatchers: None of the current options proposed for black oystercatchers are expected to reach the effectiveness level required for this alternative.

Common murres: At this time, there are no proposed options which are certain to reach the effectiveness level required for this alternative. There are two options which have the potential to greatly influence the rate of recovery for common murres; however, preliminary work would need to be completed before the effectiveness can be adequately evaluated. These options are: (#16.1) Enhancing the social stimuli, and (#17.2) Predator control to benefit marine birds. (note: greater detail provided in Alternative 3.)

Harlequin ducks: Protecting nesting habitat (#37 Habitat protection and acquisition) for harlequin ducks can prevent habitat loss which could prevent the population from fully recovering to its prespill level. In addition, in localized areas the special study Eliminating oil from oiled mussel beds (#13) has the potential to improve the rate of recovery of a localized area by 25 - 50%; however, at this time there are too many unknowns to be certain of its effectiveness.

Marbled murrelets: Protecting habitat (options #37 Habitat protection and acquisition and #40 Special designations) would ensure that the marbled murrelet population could recover to is prespill levels once the population decline is reversed. Protecting the coastal waters could also benefit their prey which may help stabilize the population more quickly. In localized areas, option #9 Minimizing incidental take of marine birds could provide additional help to stabilize the population.

Pigeon guillemots: The only option currently proposed that has the potential to produce a substantial impact on stabilizing the population needs to have preliminary work completed before the option can be adequately evaluated. Option #17.2 Predator control to benefit marine birds has the potential to increase productivity by 25-50 % at very site specific locations; however, predation levels at colonies within the injured area have not been documented and this option may not be needed should predation levels be low.

D. Fish

Cutthroat trout: Option 2 Intensify fisheries management to protect injured stocks would benefit both cutthroat trout and its dependent sport fishery. By determining the maximum sustained yield and documenting fishable areas the sport fishery could be opened, or partially opened as early as 1998. It can also be used to enhance the injured stocks an additional 5-10% above the pre-spill population level.

Habitat protection and acquisition is believed to be especially important for cutthroat trout in Prince William Sound because they are at the northern extent of their geographic range and are believed to be more vulnerable to habitat alterations.

Dolly Varden trout: Option 2 Intensify fisheries management to protect injured stocks would benefit the Dolly Varden trout population by determining the maximum sustained yield and documenting the sport fishery the fishery could be managed to protect injured stocks. It can also be used to enhance the injured stocks an additional 5-10% above the pre-spill population level.

Herring: The extent of injury to herring is still unknown. Option 2 Intensify fisheries management to protect injured stocks could improve the rate and degree of recovery by more than 50% if it is necessary. The option would allow for increased precision in stock assessment which would allow for manipulation of the harvest levels to counter all but the most extreme levels of injury.

Pink salmon: The coded-wire tagging and stock separation information that would be gained from an intensified fisheries management program (option 2) would help ensure that the wild stock population fully recover and could accelerate the recovery rate as much as 50% over natural recovery. Relocating existing hatchery runs (option 51) could substantially improve the recovery of wild stocks by reducing interception rates by 25 - 50%. The benefits of this option would be fairly localized.

Sockeye salmon: Option 2 Intensify fisheries management to protect injured stocks is the single most effective option for aiding and protecting the Keani River sockeye. With this option the risk of overescapements on the Kenai River could be reduced from 25% to 10%. In combination with management, and under the right environmental conditions, option #48 (Improve the survival of salmon eggs to fry) could be very effective for the Kenai river system. Improving survival of salmon eggs to fry could stimulate recovery so is complete around the year 2000. Monitoring of the plankton population and salmon escapement must occur in 1994/95 in order to supplement fry production in 1995. Option #11.2, Fertilization of lakes to improve sockeye rearing success could be applied to Coghill Lake to enhance sockeye production.
(effectiveness rating?***)

Rockfish: The only option that would have notable benefits to the rockfish population regardless of the injury level is to intensify the fisheries management. The added information will help direct the harvest to compensate for injury from the oil spill.

E. Coastal habitat

Coastal habitat - subtidal: At this time, no effective options have been identified that could help the recovery of subtidal organisms.

Coastal habitat - upper intertidal: Option 14 - Accelerate the recovery of the upper intertidal zone may prove to greatly increase the recovery time on a very localized basis. Experts have estimated that the option could increase the rate of recovery by 25 to 50%; however, the techniques are experimental and are not likely to be applied on a broad scale.

EFFECT ON THE RECOVERY OF SERVICES

Archaeology. Restoration of archaeological resources cannot regenerate what has been destroyed, but it can successfully address the prevention of further degradation and loss of both sites and the scientific information they contain. Site stewardship program, Site patrol and monitoring, and Preservation of archaeological sites and artifacts are highly effective techniques to protect archaeological resources in the spill-affected area. The last option entails some physical repair and data recovery. Acquiring replacements for artifacts from the spill area would be a moderately effective means of preserving and studying artifacts which were taken from the oil spill area prior to the spill and are currently in the possession of museums and agencies.

Commercial Fishing. Replacing harvest opportunities by creating new salmon runs is a highly effective method of replacing commercial fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Recreation. Three of the restoration actions included for recreation serve primarily to protect existing uses and their resource base. Habitat protection and Special designations are the primary means of protecting recreation. However, in limited situations New backcountry public recreation facilities could protect both recreation and the resources on which it depends by, for example, providing an outhouse in a heavily used area. Expanding existing visitor centers is a moderately effective way to disseminate information about spill injuries, recovery, and how the public can modify their uses of the area to maximize recovery.

Sport fishing. Replacing harvest opportunities by creating new salmon runs is a highly effective method of replacing sport fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs would continue only until wild stocks recover.

Subsistence. Testing subsistence foods is expected to be an effective way of restoring confidence in the safety of subsistence resources withing the spill area. Concern over the safety of subsistence resources is believed to be one of the reasons subsistence harvests have not yet returned to pre-spill levels. Providing Access to traditional foods in areas outside the spill-affected area would be a highly effective way of restoring lost use. Both projects would be continued until subsistence resources and use have recovered to pre-spill levels.

Wilderness. Habitat protection amd acquisition is a highly effective means of preventing additional injury to wilderness; Special designations would provide an increased level of resource protection compatible with preservation of wilderness values.

II. MULTI-SPECIES IMPACTS OF PROPOSED OPTIONS

RESOURCE RESTORATION OPTIONS:

Of the 17 resource restoration options identified in Alternative 4, 8 of them could potentially have significant multiple-species and habitat impacts.

Habitat protection and acquisition targeting harlequin ducks, marbled murrelets, bald eagles and cutthroat trout would protect the coastal fringe areas, riparian zones, watersheds and other uplands. Protection of these areas will have far reaching effects on other resources that depend on these habitats and the species which utilize them. Some of the other species that would benefit from implementing these options are: Sitka black-tailed deer; brown bears, black bears, river otters, salmon, and a variety of other fish and birds. Special designations targeting marbled murrelets would benefit terrestrial species using uplands and old growth forests.

For pigeon guillemots and common murres it is possible that reducing predators near nesting colonies would be very effective in helping the colonies recover. If it is determined that predation is a serious problem at injured colonies then implementation of this option could be considered. This option would also benefit other species that are preyed upon by the gulls and weasels. Even though implementing this option for either murres or guillemots would not have a long-term effect on the predator population there is obviously a negative ecological cost to the predators. Therefore, the ecological costs and benefits will be carefully weighed to determine if the option should be implemented.

There were no options identified that would have the effectiveness level required in this alternative that would benefit black oystercatchers; however, if habitat protection were extended to the coastline, black oystercatcher and pigeon guillemot habitat would be protected. In addition, two of the special studies could benefit black oystercatchers if implemented in areas which are have, or had, high use.

These special study options include eliminating oil from oiled mussel beds and accelerating the upper intertidal. Both of these options affect lower levels of the food chain which can benefit many species. For instance, accelerating the growth rate of the seaweed *Fucus* would accelerate the colonization of invertebrates such as limpets. Limpets are one of the main prey species for black oystercatchers whose eggs and chicks are preyed upon by gulls, ravens, and some mammalian predators. Limpets and other small invertebrates are consumed by other species which are then taken by birds, river otters, etc. Although both of these special study options have effects on many species, they are not likely to be applied on a broad scale to benefit more than a localized area.

Improving survival rates of juvenile sockeye salmon and Fertilizing lakes to improve sockeye rearing success could benefit marine and terrestrial predators which feed on salmon eggs, juvenile and adults. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. However, the option needs to be carefully implemented so as not to exceed the carrying capacity of the ecosystem by producing large numbers of new fish.

Relocating existing hatchery runs to benefit wild pink salmon could have negative impacts on seabirds and marine mammals if fishing pressures are shifted into areas used heavily by these species. These impacts could be avoided by carefully choosing the location and timing of the relocation.

SERVICE RESTORATION OPTIONS

Of the 11 service restoration options proposed for Alternative 4, 5 of them have potential impacts on multiple species and habitats.
Building new backcountry, public recreation facilities has potential negative impacts on all species if facilities are sited so as to increase human use of damaged habitats or other areas supporting recovering species. Alternatively, properly sited facilities could 'harden' use areas and direct uses away from injured areas and promote undisturbed natural recovery of injured resources.

Habitat acquisition and Special designations for recreational purposes could benefit injured resources by protecting them from development and disturbances incompatible with recreation. On the other hand, these options could, if not carefully implemented, increase human use of damaged areas and slow natural recovery rates.

Spill prevention and contingency planning could benefit all species by preventing additional spills which would further compound existing injuries. ***where does this option really go?

Replacing harvest opportunities by creating new salmon runs would benefit commercial and sport fishermen. Positive multi-species impacts would result from benefits to the many species which prey on salmon adults, eggs and juveniles. Benefits would be higher in the case of stream stocking programs, since eggs, juveniles and adult would be available to marine and terrestrial predators. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. Terminal hatchery runs would provide fewer species with prey, since only adults and juveniles would be available to marine predators.

Negative impacts include the possibility of increasing mortality of seabirds and marine mammals due to interactions
with new commercial fisheries. Also, wild-stock pink salmon could possibly be impacted by fish from new runs straying into wild streams. Lastly, new runs stocked into streams which did not previously support salmon might harm resident fish through competition for food and spawning habitat.

III. GEOGRAPHIC DISTRIBUTION

Table 3 indicates the part of the spill area where the options will most likely be applied. The areas may change as detailed project planning is completed and as more is learned about injury or recovery.

Most options are applied throughout the spill area. Many of the options involving fish are applicable only in Prince William Sound including management plans for: cutthroat trout and Dolly Varden char, herring, pink salmon, rockfish (also applied to Kenai), and Coghill Lake fertilization. Projects involving sockeye are applied when applicable to Kenai and Red Lake (on Kodiak).

IV. COST

Detailed cost estimates for Alternative 4 are contained in Table ___; the allocation of these costs is shown in Figure ___. Estimates of cost are approximate. No cost estimates are included for Special designations and Spill prevention and contingency planning because no particular designation is under consideration and spill prevention and contingency planning appears to be well funded at present. However, these situations could change over time. Actual costs will vary as new information about injury becomes available through the monitoring program, new ideas are developed for appropriate restoration options, and project planning proceeds.

The inflation-adjusted value of the remainder of the settlement fund is about $522 million. Over half (57%) of this amount could be set aside for Habitat Protection. Monitoring would require about 10%; Aministration/Information 9%; and Other Restoration actions 5%.

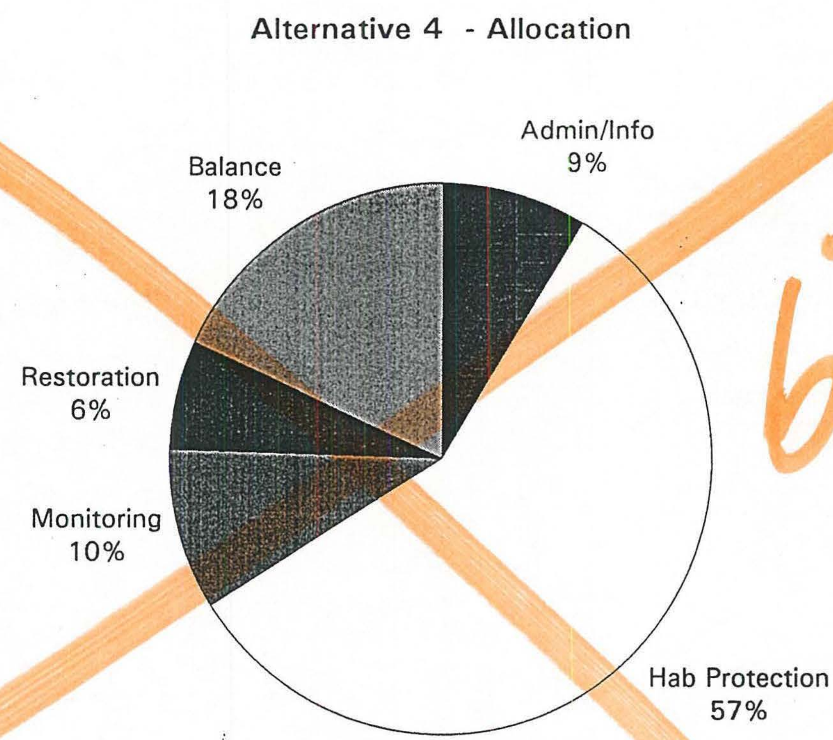
This scenario would leave 18% of the remaining settlement uncommitted. Uncommitted funds could be held for unanticipated expenses, such as injuries identified through the monitoring program, new options, or higher-than-projected costs for those already considered. Another use of the balance could be to fund an endowment for ongoing projects or for a research foundation. If the entire balance were invested in an endowment it would yield about $2.6 million annually.

RESOURCE OR SERVICE	Opt. No.	OPTION NAME	Prince William Sound			Kenai/Cook Inlet			Alaska	Kodiak/Afog		Outside
			North	East	West	Kenai Ck In	Lower Ck In	Central Ck In	Penin.	Afg. Shuyak	Kodiak	EVOS
Archaeology	1	Archeological site stewardship program	X	X	X	X	X	X	X	X	X	
Cutthroat/Dolly Varden Trout	2.1	Intensify Cuttroat/Dolly mgmt to protect injured		X	X							
Herring	2.2	Intensify herring mgmt to protect inj stocks	X	X	X							
Pink salmon	2.3	Intensify pink salmon mgmt to protect inj stocks	X	X	X							
Rockfish	2.4	Intensify rockfish mgmt to protect injured stocks	X	X	X	X	X	X				
Sockeye salmon	2.5	Intensify sockeye mgmt to protect inj stocks										
Marbled murrelet	9	Minimize incidental take by comm fish	X	X	X	X	X	X	X	X	X	
Archaeology	10	Preserve archaeological sites and artifacts	X	X	X	X	X	X	X	X	X	
Coghill Lake Fertilization	11.2	Fertilize lakes to improve sockeye rearing succe	X									
Recreation	12.1	Construct New backcountry public facilities	X	X	X	X	X	X	X	X	X	
Harlequin duck	13	Eliminate oil from mussel beds			X	X	X	X	X	X	X	
Upper intertidal	14	Accelerate recovery of upper intertidal zone			X	X	X	X	X	X	X	
Pigeon guillemot	17.2	Reduce predator access (Pigeon Guillemot)	X	X	X	X	X	X	X	X	X	
Comm'l & Sport Fishing	18	Replace salmon harvest opportunities	X	X	X						X	
Subsistence	30	Test subsistence foods for oil contamination		X	X						X	
Research & Education	33.1	Expand existing visitor center(s)										
Research & Education	34.2	Fund a marine research prog or foundation										
Archaeology	35	Acquire replacements for artifacts from the spill	X	X	X	X	X	X	X	X	X	X
MULTI-SPECIES	37	Habitat Protection and Acquisition		X	X	X	X	X	X	X	X	
MULTI-SPECIES	40	Special designations	X	X	X	X	X	X	X	X	X	
Prevention	44	Spill prevention and contingency plannin	X	X	X	X	X	X			X	
Harbor seal	46	Cooperative program with fishermen	X	X	X							
Harbor seal & Sea Otter	47	Cooperative program with subsistence users		X	X						X	
Sockeye salmon	48	Improve survaval rates of salmon eggs & juv.								X	X	
Subsistence	49	Provide subsistence users access		X	X						X	
Pink salmon	51	Relocate existing hatchery runs	X	X	X							

~~ALTERNATIVE#4~~

Table X. Expected Geographic Distribution of Options in Alternative #4

Allocation of Remainder of Settlement Funds	Total $	%
Admin/Info	45190.0	9%
Hab Protection	300000.0	57%
Monitoring	50250.0	10%
Restoration	33247.0	6%
Balance	93313.0	18%



see brochure

NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

Alternative 4 - Moderate Restoration

Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION	Years			TOTAL COST 10-Year Maximum		
				Exp	Low	High	Type	E	L	H	Expected	Lower	Higher
1.10	Site stewardship program	Archaeology	Per 3 areas	195.0	195.0	195.0	Ltd	10	10	10	1950.0	1950.0	1950.0
1.20	Site patrol and monitoring	Archaeology		300.0	300.0	300.0	Ltd	4	3	5	1200.0	900.0	1500.0
2.10	Intensify management	Cutthroat/Dolly		145.0	130.0	160.0	Ltd	2	2	2	290.0	260.0	320.0
2.20	Intensify management	Pacific herring		457.0	457.0	457.0	Ltd	2	2	4	914.0	914.0	1828.0
2.30	Intensify management	Pink salmon		1200.0	900.0	1500.0	Ltd	2	2	4	2400.0	1800.0	6000.0
2.40	Intensify management	Rockfish		593.0	593.0	593.0	Ltd	2	1	4	1186.0	593.0	2372.0
2.50	Intensify management	Sockeye salmon		750.0	700.0	800.0	Ltd	5	2	5	3750.0	1400.0	4000.0
4.30	Study: Reduce disturbance	Sea otter					Ltd				120.0	80.0	640.0
9.00	Minimize incidental take	Marbled murrelet									1625.0	1100.0	2000.0
10.00	Archaeol Res Protection	Archaeology									4072.0	3250.0	7000.0
11.20	Fertilize lakes	Sockeye salmon	Per lake	190.0	150.0	220.0	Ltd	3	1	5	570.0	150.0	1100.0
12.10	New backcountry rec facilities	Recreation									1620.0	480.0	3256.0
13.10	Eliminate oil from mussel beds	Harlequin duck		491.0	340.0	641.0	Ltd	5	4	7	2455.0	1360.0	4487.0
13.20	Study: Elim oil fr mussel beds	Sea otter											
14.10	Accelerate recovery of UIT	Intertidal organisms		150.0	100.0	200.0	UR	5	4	7	750.0	400.0	1400.0
16.10	Study: Social stimuli	Common murre					Ltd				850.0	800.0	5500.0
17.10	Eliminate introduced foxes	Seabird repl					UR				2500.0	1500.0	3500.0
17.21	Reduce predator access	Common murres		350.0	300.0	400.0	Ltd	5	5	10	1750.0	1500.0	4000.0
17.22	Reduce predator access	Pigeon guillemot		200.0	150.0	250.0	Ltd	4	4	6	800.0	600.0	1500.0
18.10	Replace harvest opportunities	Comm fishing	Per run	150.0	100.0	200.0	Ltd	2	1	5	300.0	100.0	1000.0
18.20	Replace harvest opportunities	Sport fishing	Per run	150.0	50.0	200.0	Ltd	2	1	5	300.0	50.0	1000.0
30.00	Test subsistence foods	Subsistence		330.0	300.0	350.0	Ltd	3	2	5	990.0	600.0	1750.0
35.00	Aquire archaeol. artifacts	Archaeology		225.0	150.0	300.0	Ltd	3	3	3	675.0	450.0	900.0
37.00	Habitat protection/acquisition	Multiple resources									300000.0	225000.0	350000.0
40.00	Special designation	Multiple resources											
44.00	Spill prevention/conting plng	Multiple resources					Ltd						
46.00	Coop prgm-fishermen	Harbor seal		50.0	30.0	100.0	Ltd	3	1	5	150.0	30.0	500.0
47.10	Coop prgm-subsistence users	Harbor seal		30.0	30.0	30.0	UR	10	10	10	300.0	300.0	300.0
47.10	Coop prgm-subsistence users	Sea otter					UR						
48.20	Improve survival rates	Sockeye salmon	Per run	400.0	200.0	600.0	Ltd	3	1	5	1200.0	200.0	3000.0
49.00	Access to traditional foods	Subsistence		53.0	50.0	60.0	UR	10	10	10	530.0	500.0	600.0
51.00	Relocate existing hatchery runs	Pink salmon	Per run				Ltd	22	2	3			
P1.00	Administration	Multiple resources									45190.0	30180.0	50200.0
P2.00	Monitoring	Multiple resources									50250.0	20250.0	70250.0

NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

Alternative 5 - Comprehensive Restoration

THEME	Take all beneficial actions to protect and restore all injured resources and services. Increase opportunities for human use in the affected area.
VARIABLES	
Injury	All injured resources.
Status of Recovery	All stages of recovery
Effectiveness of Restoration Actions	All beneficial actions.
Opportunities for Human Use	Protect or increase existing uses; or encourage appropriate new uses.

Monitoring and information programs are included in all alternatives.
Functional equivalents of injured resources and services are included in all alternatives.

The goal of this alternative is for all injured resources and services to return or exceed prespill levels. Table _____ lists the resources and services addressed in this alternative; they are identical to those addressed in Alternatives 2 and 4. This alternative includes actions that protect existing human uses that were injured and the resource base on which they depend and also those actions that would increase existing use or create new uses. An example of the last item is a new commercial facility on public land that attracts different types of uses than had previously existed there.

RESOURCES		SERVICES
Population Decline	Sublethal/Chronic	
Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organism Killer whale Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon Subtidal organisms	Bald eagle Cutthroat trout Dolly varden Pacific herring Pink salmon River otter Rockfish	Archaeology Commercial fishing Recreation Sport fishing Subsistence Wilderness

Table _____. Resources and Services Addressed in Alternative 5.

Restoration Options. Among the many restoration ideas suggested by scientist, agencies, and the public, 38 meet the criteria for this alternative. Of these, 21 are identical to those in Alternative 3; and 7 are identical to those in Alternative 4. There is at least one effective restoration action for each injured resource or service except subtidal organisms. Table ___ lists restoration options by resource or service. These options are presented as potential projects which have already been evaluated; they are not proposals. Over time, other options are likely to be proposed which may be superior to those listed here.

In this alternative, Restoring salmon harvest opportunities for commercial and sport fishing could continue after wild stocks of salmon recover to prespill levels. Testing subsistence foods for hydrocarbon contaimination and providing Access to traditional foods in areas outside the spill-affected area could be continued only after subsistence resources and use return to prespill levels. In addition, funding for New backcountry public recreation facilities and Planning and marketing of public land for commercial recreation facilities, Visitor centers, and Marine environmental institute would be considered to protect or increase existing recreational uses or encourage new ones. Habitat Protection and Acquisition would apply to only the following resources and services:

Black oystercatcher	Bald eagle	Recreation
Harlequin duck	Cutthroat trout	Wilderness
Marbled murrelet	Dolly varden	
Sockeye salmon	Pink salmon	

Monitoring

Monitoring under this alternative is designed to assess the effectiveness of restoration options used in combination
inclusive of managing human uses, directly manipulating resources and services, protecting and acquiring critical habitat, and replacing or acquiring the equivalent of injured resources and services. Monitoring of this type is designed to identify where additional restoration activities may be appropriate, and determine when injury is delayed.

This alternative also includes the provision to monitor the dynamics of other ecological components, e.g., those important in the food chain (web) of injured species. This type of monitoring is useful in detecting residual effects of the oil spill many years removed form the event, and it provides a baseline from which to assess the impacts of future oils spills and other disturbance. It also generates a database that facilitates greater understanding of how our changing environment affects the species that we manage and protect.

For those resources and services where little can be done to accelerate recovery, e.g., sea otters, Alternative 5 also includes provision to determine when natural recovery will restore injured resources and services to their pre-spill conditions. It also is assumed that normal agency management and monitoring will not be duplicated.

Under this alternative, monitoring will be conducted for all injured resources and services, irregardless of the severity of injury or our understanding of the status of recovery. Monitoring will be conducted in conjunction with all restoration measures implemented, even those that we are less certain will
produce a beneficial effect. Monitoring recovery of injured services also will be undertaken in association with restoration measures designed to protect, restore, and to increase (enhance) existing (pre-spill) human-use activities.

Monitoring will be conducted on and in surface waters, on tidelands, and on adjacent uplands including their watersheds in Prince William Sound and the Gulf of Alaska. Monitoring also will be conducted outside the spill affected area to measure the effectiveness of replacement and acquisition of equivalent resources and services options, e.g. eliminate predators from marine bird colonies on Aleutian Islands, included in this alternative.

Monitoring will continue dependent upon the severity and duration of injuries resulting from the oil spill and the time necessary to establish a trend for recovery. Some monitoring components, e.g., those designed to document long-term trends in the health of the affected ecosystem, would continue in perpetuity if supported by an endowment.

Resources to be monitored include but are not restricted to affected floral (sea grasses and seaweeds) and faunal (Marine mammals, marine birds including sea ducks), etc. <u>See complete list of resources and services to be monitored in Alternative 1.</u>

<u>Costs of monitoring for this alternative is $6.0 million per year with a range of $5.0-$7.0 million per year. Of the $6.0 million per year figure, $4.0 million is allotted to monitoring the effectiveness of restoration; $1.0 million per year is allotted to monitoring natural recovery; and $1.0 million per year is allotted to monitoring long-term trends in the health of the ecosystem.</u>

RESOURCE/SERVICE	RESTORATION OPTION
Black oystercatcher	14.0 Accelerate recovery - upper intertidal 37.0 Habitat protection and acquisition 40.0 Special designations
Common murre	4.1 Reduce disturbance at marine bird colonies 16.1 Study: Social stimuli 17.2 Reduce predator access
Harbor seal	4.2 Reduce disturbance at marine mammal haul-out areas 46.0 Cooperative program - fishers 47.0 Cooperative program - subsistence users
Harlequin duck	8.0 Develop sport harvest guidelines 13.0 Eliminate oil from mussel beds 37.0 Habitat protection and acquisition
Intertidal organisms	14.0 Accelerate recovery - upper intertidal
Killer whale	45.0 Study: Changes in black cod fishery gear
Marbled murrelet	9.0 Minimize incidental take 37.0 Habitat protection and acquisition 40.0 Special designations
Pigeon guillemot	17.2 Reduce predator access
Sea otter	4.2 Study: Reduce disturbance 13.0 Eliminate oil from mussel beds 47.0 Cooperative program - subsistence users
Sockeye salmon	2.5 Intensify management 11.3 Improve access: salmon fish passes 37.0 Habitat protection and acquisition 48.2 Improve survival rates
Subtidal organisms	None
Bald eagle	37.0 Habitat protection and acquisition
Cutthroat trout	2.1 Intensify management 19.0 Anadromous Streams Catalogue 37.0 Habitat protection and acquisition
Dolly varden	2.1 Intensify management 19.0 Anadromous Streams Catalogue 37.0 Habitat protection and acquisition
Pacific herring	2.2 Intensify management

Pink salmon	2.3 Intensify management 11.1 Construct salmon spawning channels 11.3 Improve access: salmon fish passes 19.0 Anadromous Streams Catalogue 37.0 Habitat protection and acquisition 40.0 Special designations 48.0 Improve survival rates of salmon eggs and juveniles 51.0 Relocate existing hatchery runs
River otter	8.0 Develop sport and trapping harvest guidelines
Rockfish	2.4 Intensify management
Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring 10.0 Preserve archaeological sites and artifacts 35.0 Acquire replacements for artifacts from the spill area
Commercial fishing	11.2 Fertilize lakes to improve sockeye salmon rearing success 18.0 Replace salmon harvest opportunities
Recreation	12.1 New backcountry public recreation facilities 12.2 Plan and market public land for commercial rec facilities 33.1 Visitor centers 34.0 Marine environmental institute 37.0 Habitat protection and acquisition 40.0 Special designations
Sport fishing	11.2 Fertilize lakes to improve sockeye salmon rearing success 18.0 Replace salmon harvest opportunities
Subsistence	18.0 Replace salmon harvest opportunities 30.0 Test subsistence foods 49.0 Access to traditional foods 50.1 Develop subsistence mariculture sites 50.2 Develop bivalve shellfish hatchery and rescue center
Wilderness	37.0 Habitat protection and acquisition 40.0 Special designations
Multiple resources	44.0 Spill prevention and contingency planning

Table ____. Restoration Options for Alternative 5.

EVALUATION

I. EFFECT ON THE RECOVERY OF RESOURCES:

A. MARINE MAMMALS

Harbor seals (first priority): At present, disturbance of harbor seals at their haulout sites is not believed to be a significant problem, therefore reducing disturbance at marine mammal haulout sites (option 4.0) has less effectiveness than the other two options proposed. However, this option would ensure that disturbance remains minimal and protects harbor seals from additional pup mortality that could be caused if disturbance patterns change.

The two options which have the greatest potential to benefit harbor seals are: Develop a cooperative program with subsistence users, and Develop a cooperative program with commercial fishermen. These programs which will help provide greater management by coordinating managers, researchers, subsistence users and commercial fishermen. These options are in the first priority level for Alternative 6.

Killer whales - AB pod (first priority): The most effective option to provide protection for the AB pod is an option to determine the feasibility of facilitating gear changes in the black cod fishery from long-lines to pots. If this option is feasible it would prevent the whales from marauding the catch and eliminate the need for fishermen to defend their harvest.

Sea otters (first priority): The option believed to have the greatest ability to effect the overall sea otter population is to Develop a cooperative program with subsistence users. This option would help ensure that the sea other population fully recovers to its pre-spill level and sustain any changes in harvest levels. In addition, the special study of Eliminating oil from oiled mussel beds could be highly effective (25% to over 50%) in improving the weanling pups survival and recruitment rates if oiled mussel beds are determined to be a major reason for the poor weanling survival.

Very little is known about the effects of disturbance from boat traffic or from harvest and development of coastal lands. A special study which investigates the impact of such activities would determine if Option 4, reducing disturbance at marine mammal haulout sites and concentration areas or Option 37, habitat protection and acquisition should be implement to protect the injured sea otter population.

B. TERRESTRIAL MAMMALS

River otters: If the injury to the river otter population is not chronic from reduced habitat quality, then an option to develop sport and trapping harvest guidelines could be beneficial in restoring the population.

C. BIRDS

Bald eagles: Habitat protection and acquisition is the only option that is likely to provide direct benefit to the bald eagle population. Because there are already mandatory protection for bald eagles, the benefits from this option will be limited.

Black oystercatchers (first priority): Special designations that protect areas where black oystercatchers concentrate (usually subadults and failed breeders), or restrict access to injured beaches with serveral breeding pairs may improve the rate of recovery by about 10%. In localized, site-specific areas the rate of recovery may be improved by 10 - 24% by implementing the special study option to accelerate recovery of the upper intertidal zone (#14).

Common murres (first priority): There are two options which have the potential to greatly influence the rate of recovery for common murres; however, preliminary work would need to be completed before the effectiveness can be adequately evaluated. These options are: (#16.1) Enhancing the social stimuli, and (#17.2) Predator control to benefit marine birds. (note: greater detail provided in Alternative 3.) In addition, a feasibility to examine the effectiveness of modifying the characteristics of the nesting ledges may provide another option to improve the recovery rate.

Other options which would provide less direct benefits, but would effect a larger portion of the colonies include reducing disturbance at marine bird colonies, which could reduce the recovery time by 10 -24%; and special designations which would have the same effect but cover an even broader geographic area.

Harlequin ducks (first priority): Protecting nesting habitat (#37 Habitat protection and acquisition) for harlequin ducks can prevent habitat loss which could prevent the population from fully recovering to its prespill level. In addition, in localized areas the special study Eliminating oil from oiled mussel beds (#13) has the potential to improve the rate of recovery of a localized area by 25 - 50%; however, at this time there are too many unknowns to be certain of its effectiveness.

The current early season closure for hunting harlequin ducks is believed to be benefiting the rate of recovery by 10 - 24%. Additional late season closures are expected to provide only minor added benefits.

Marbled murrelets (first priority): Protecting habitat (options #37 Habitat protection and acquisition and #40 Special designations) would ensure that the marbled murrelet population could recover to is prespill levels once the population decline is reversed. Protecting the coastal waters could also benefit their prey which may help stabilize the population more quickly. In localized areas, option #9 Minimizing incidental take of marine birds could provide additional help to stabilize the population.

Pigeon guillemots (first priority): Option #17.2 Predator control to benefit marine birds has the potential to increase productivity by 25-50 % at very site specific locations; however, predation levels at colonies within the injured area have not been documented and this option may not be needed should predation levels be low. Preliminary work must be completed before this option can be adequately evaluated.

Pigeon guillemots are fairly tolerant of human activities, however, it is important to protect nesting habitat from erosion and other degradation. Habitat protection and acquisition of lands immediately adjacent to the coast would prevent the population decline from accelerating due to lost nesting habitat.

D. FISH

Cutthroat trout: Option 2 Intensify fisheries management to protect injured stocks would benefit both cutthroat trout and allow the sport fishery to be opened as early as 1998. It can also be used to enhance the injured stocks an additional 5-10% above the pre-spill population level.

Habitat protection and acquisition is believed to be especially important for cutthroat trout in Prince William Sound because they are at the northern extent of their geographic range and are believed to be more vulnerable to habitat alterations. Likewise, updating the Alaska anadromous stream catalog would help ensure that all injured stocks are identified and protected.

Dolly Varden trout: Option 2 Intensify fisheries management to protect injured stocks would benefit the Dolly Varden trout population by determining the maximum sustained yield and documenting the sport fishery the fishery could be managed to protect injured stocks. It can also be used to enhance the injured stocks an additional 5-10% above the pre-spill population level.

Herring: The extent of injury to herring is still unknown. Option 2 Intensify fisheries management to protect injured stocks could improve the rate and degree of recovery by more than 50% if it is necessary. The option would allow for increased precision in stock assessment which would allow for manipulation of the harvest levels to counter all but the most extreme levels of injury.

Pink salmon: The coded-wire tagging and stock separation information that would be gained from an intensified fisheries management program (option 2) would help ensure that the wild stock population fully recover and could accelerate the recovery rate as much as 50% over natural recovery. Relocating existing hatchery runs (option 51) could substantially improve the recovery of wild stocks by reducing interception rates by 25 - 50%. The benefits of this option would be fairly localized.

Other options that could provide additional benefit to specific streams if implemented in conjunction with option 2 included: Improve survival of salmon eggs to fry, which could also provide short-term enhancement (10 - 24%); improve access to salmon spawning areas by building fish passes or removing barriers, could improve recovery and provide long-term enhancement; construct salmon spawning channels and other instream improvements could increase spawning production by 10 -20 %. Unfortunately there are very few locations that these options can be implemented so the overall effectiveness on the population is limited.

Habitat protection and acquisition could provide protection to habitat for 10 - 30% of the population, especially for stocks found outside of Prince William Sound where more pinks spawn above the intertidal zone. The added protection from this option and from updating the anadromous stream catalog could increase the overall population by 10%.

Rockfish: The only option that would have notable benefits to the rockfish population regardless of the injury level is to intensify the fisheries management. The added information will help direct the harvest to compensate for injury from the oil spill.

Sockeye salmon - Kenai river and Red Lake (first priority): Option 2 Intensify fisheries management to protect injured stocks is the single most effective option for aiding and protecting the two injured systems. With this option the risk of overescapements on the Kenai River could be reduced from 25% to 10%. In combination with management, and under the right environmental conditions, option #48 (Improve the survival of salmon eggs to fry) could be very effective for the Kenai river system. Improving survival of salmon eggs to fry could stimulate recovery so is complete around the year 2000. Monitoring of the plankton population and salmon escapement must occur in 1994/95 in order to supplement fry production in 1995.

Improving access to salmon spawning areas by building fish passes or removing barriers (11.3) can be used to enhance the Red Lake population by 10 - 24%. In addition Habitat protection and acquisition may be used to protect specific areas of the Kenai River drainage or to protect the watershed that feeds into Red Lake.

E. COASTAL HABITAT

Coastal habitat - subtidal: At this time, no effective options have been identified that could help the recovery of subtidal organisms.

Coastal habitat - upper intertidal (first priority): Option 14 - Accelerate the recovery of the upper intertidal zone may prove to greatly increase the recovery time on a very localized basis. Experts have estimated that the option could increase the rate of recovery by 25 to 50%; however, the techniques are experimental and are not likely to be applied on a broad scale.

EFFECT ON THE RECOVERY OF SERVICES

Archaeology. Restoration of archaeological resources cannot regenerate what has been destroyed, but it can successfully address the prevention of further degradation and loss of both sites and the scientific information they contain. Site stewardship program, Site patrol and monitoring, and Preservation of archaeological sites and artifacts are highly effective techniques to protect archaeological resources in the spill-affected area. The last option entails some physical repair and data recovery. Acquiring replacements for artifacts from the spill area would be a moderately effective means of preserving and studying artifacts which were taken from the oil spill area prior to the spill and are currently in the possession of museums and agencies.

Commercial Fishing. Replacing harvest opportunities by creating new salmon runs is a highly effective method of replacing commercial fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs could continue after wild stocks recover.

Recreation. Three of the restoration actions included for recreation serve primarily to protect existing uses and their resource base. Habitat protection and Special designations are the primary means of protecting recreation. However, in limited situations New backcountry public recreation facilities could protect both recreation and the resources on which it depends by, for example, providing an outhouse in a heavily used area.

Planning an marketing new commercial facilities on public land would be an effective way of encouraging new recreational uses of the spill area. Creating new visitor centers or building a Marine environmental institute would encourage new uses of the spill area. These options are also effective ways to disseminate information about spill injuries, recovery, and how the public can modify their uses of the area to maximize recovery.

Sport fishing. Replacing harvest opportunities by creating new salmon runs is a highly effective method of replacing sport fishing opportunities lost due to fishing closures or reduced harvest of species injured by the spill. In this alternative, the newly created runs could continue after wild stocks recover.

Subsistence. Testing subsistence foods is expected to be an effective way of restoring confidence in the safety of subsistence resources withing the spill area. Concern over the safety of subsistence resources is believed to be one of the reasons subsistence harvests have not yet returned to pre-spill levels. Providing Access to traditional foods in areas outside the spill-affected area would be a highly effective way of restoring lost use. Both projects would be continued until subsistence resources and use have recovered to pre-spill levels.

Developing subsistence mariculture sites and Funding a shellfish hatchery and technical research center would benefit subsistence users by providing a source of uncontaminated shellfish for their diets. Given that traditional shellfish beaches may remain contaminated for several years, or be perceived to be contaminated, these options create moderate improvements in the rate and degree of recovery.

Replacing harvest opportunities by creating new salmon runs is an effective method of replacing subsistence harvest opportunities lost due to fishing closures or reduced harvest of species injured by the spill. New runs of salmon could replace other sources of food which are perceived as unsafe to eat, such as some shellfish and marine mammals. The option would result in moderate increases in the rate and recovery of subsistence. In this alternative, the newly created runs could continue after wild stocks recover.

Wilderness. Habitat protection amd acquisition is a highly effective means of preventing additional injury to wilderness; Special designations would provide an increased level of resource protection compatible with preservation of wilderness values.

II. MULTI-SPECIES IMPACTS OF PROPOSED OPTIONS

RESOURCE RESTORATION OPTIONS:

11 of the resource restoration options identified in Alternative 5 could potentially have significant multiple-species and habitat impacts.

Habitat protection and acquisition targetting harlequin ducks, bald eagles, marbled murrelets, pink and sockeye salmon, cutthroat trout and Dolly Varden would protect coastal fringe areas, riparian zones, watersheds and other uplands. Protection of these areas will have far reaching effects on other resources that depend on these areas and the species which utilize them. Some of the other species that would benefit from implementing these options are: Sitka black-tailed deer; brown bears, black bears, river otters, and several species of fish and birds. Special designations targetting pink salmon, black oystercatchers and marbled murrelets would benefit all other species utilizing anadromous streams, intertidal areas and old growth forests.

For pigeon guillemots and common murres it is possible that reducing predators near nesting colonies would be very effective in helping the colonies recover. If it is determined that predation is a serious problem at injured colonies then implementation of this option could be considered. This option would also benefit other species that are preyed upon by the gulls and weasels. Even though implementing this option for either murres or guillemots would not have a long-term effect on the predator population there is obviously a negative ecological cost to the predators. Therefore, the ecological costs and benefits will be carefully weighed to determine if the option should be implemented.

There were no options identified that would have the effectiveness level required in this alternative that would benefit black oystercatchers; however, if habitat protection were extended to the coastline, black oystercatcher and pigeon guillemot habitat would be protected. In addition, two of the special studies could benefit black oystercatchers if implemented in areas which are have, or had, high use.

These special study options include eliminating oil from oiled mussel beds and accelerating the upper intertidal. Both of these options affect lower levels of the food chain which can benefit many species. For instance, accelerating the growth rate of the seaweed *Fucus* would accelerate the colonization of invertebrates such as limpets. Limpets are one of the main prey species for black oystercatchers whose eggs and chicks are preyed upon by gulls, ravens, and some mammalian predators. Limpets and other small invertebrates are consumed by other species which are then taken by birds, river otters, etc. Although both of these special study options have effects on many species, they are not likely to be applied on a broad scale to benefit more than a localized area.

Constructing spawning channels, Fertilizing lakes to improve sockeye rearing success, Improving access to spawning areas and Increasing survival of juvenile salmon are all options which could benefit marine and terrestrial predators which feed on salmon eggs, juvenile and adults. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. However, the options need to be carefully implemented so as not to exceed the carrying capacity of the ecosystem by producing large numbers of new fish. In addition, when these options result in new harvest patterns, care should be taken to minimize impacts on existing fisheries as well as interactions with seabirds and marine mammals.

Updating the anadromous stream catalogue for any one species has the benefit of providing increased regulatory protection for all anadromous species, as well as resident fish. This includes all salmon species, trout and Dolly Varden.

Relocating existing hatchery runs to benefit wild pink salmon could have negative impacts on seabirds and marine mammals if fishing pressures are shifted into areas used heavily by these species. These impacts could be avoided by carefully choosing the location and timing of the relocation.

SERVICE RESTORATION OPTIONS

8 of the service restoration options proposed for Alternative 5 have potential impacts on multiple species and habitats.

Building new backcountry, public recreation facilities has potential negative impacts on all species if facilities are sited so as to increase human use of damaged habitats or other areas supporting recovering species. Alternatively, properly sited facilities could 'harden' use areas and direct uses away from injured areas and promote undisturbed natural recovery of injured resources.

Planning and marketing new commercial facilities on public land could potentially have negative impacts on all injured species. Human use of the area would be substantially increased and would result in disturbance of recovering species. Impacts could be reduced by siting new facilities near population centers or along heavily travelled routes.

Habitat acquisition and Special designations for recreational purposes could benefit injured resources by protecting them from development and disturbances incompatible with recreation. On the other hand, these options could, if not carefully implemented, increase human use of damaged areas and slow natural recovery rates.

Creating new visitor centers or building a Marine environmental institute could benefit all injured resource by increasing public awareness of the nature of injury and recovery, and why it is important not to create additional human disturbances in damaged areas. However, if new visitor centers were sited in areas which would increase human use of recovering habitats, natural recovery would be slowed. This could be avoided by siting centers near existing population centers.

Spill prevention and contingency planning could benefit all species by preventing additional spills which would further compound existing injuries. ***where does this option really go?

Replacing harvest opportunities by creating new salmon runs would benefit commercial and sport fishermen. Positive multi-species impacts would result from benefits to the many species which prey on salmon adults, eggs and juveniles. Benefits would be higher in the case of stream stocking programs, since eggs, juveniles and adult would be available to marine and terrestrial predators. This includes bald eagles, brown bears, cutthroat trout and Dolly Varden, harlequin ducks, killer whale, harbor seals and river otters. Terminal hatchery runs would provide fewer species with prey, since only adults and juveniles would be available to marine predators.

Negative impacts include the possibility of increasing mortality of seabirds and marine mammals due to interactions
with new commercial fisheries. Also, wild-stock pink salmon could possibly be impacted by fish from new runs straying into wild streams. Lastly, new runs stocked into streams which did not previously support salmon might harm resident fish through competition for food and spawning habitat.

III. GEOGRAPHIC DISTRIBUTION

Table 3 indicates the part of the spill area where the options will most likely be applied. The areas may change as detailed project planning is completed and as more is learned about injury or recovery.

Most options are applied throughout the spill area. Protective options are for the most part applied throughout the spill area. Active restoration projects targeting specific biologic conditions apply where the injury occurred. Others involving more wide-spread injuries such as those targeting recreation and education apply over more regions.

IV. COST

Detailed cost estimates for Alternative 5 are contained in Table ___; the allocation of these costs is shown in Figure ___. Estimates of cost are approximate. No cost estimates are included for Special designations and Spill prevention and contingency planning because no particular designation is under consideration and spill prevention and contingency planning appears to be well funded at present. However, these situations could change over time. Actual costs will vary as new information about injury becomes available through the monitoring program, new ideas are developed for appropriate restoration options, and project planning proceeds.

The inflation-adjusted value of the remainder of the settlement fund is about $522 million. Less than half (42%) of this amount could be set aside for Habitat Protection. Monitoring would require about 12%; Aministration/Information 10%; and Other Restoration actions 18%.

This scenario would leave 18% of the remaining settlement uncommitted. The balance

For Table Title – See Next Page –

RESOURCE OR SERVICE	Opt. No.	OPTION NAME	North	East	West	Kenai Ck In	Lower Ck In	Central Ck In	Alaska Penin.	Afg. Shuyak	Kodiak	Outside EVOS
Archaeology	1	Archeological site stewardship program	X	X	X	X	X	X	X	X	X	
Cutthroat/Dolly Varden Trout	2.1	Intensify Cuttroat/Dolly mgmt to protect injured		X	X							
Herring	2.2	Intensify herring mgmt to protect inj stocks	X	X	X							
Pink salmon	2.3	Intensify pink salmon mgmt to protect inj stocks	X	X	X							
Rockfish	2.4	Intensify rockfish mgmt to protect injured stocks	X	X	X	X	X	X				
Sockeye salmon	2.5	Intensify sockeye mgmt to protect inj stocks										
Common murre	4.1	Reduce disturbance at marine bird colonies				X	X	X	X			
Harbor seal	4.2	Reduce disturbance at marine mammal haulout	X	X	X	X	X	X				
Harlequin Duck	8	Develop sport harvest guidelines for injured spe	X	X	X	X	X	X				
River otter	8	Develop sport and trapping harvest guidelines	X	X	X							
Marbled murrelet	9	Minimize incidental take by comm fish	X	X	X	X	X	X	X	X	X	
Archaeology	10	Preserve archaeological sites and artifacts	X	X	X	X	X	X	X	X	X	
Pink salmon	11.1	Construct salmon spawning channels	X	X	X							
Coghill Lake Fertilization	11.2	Fertilize lakes to improve sockeye rearing succe	X									
Pink salmon	11.3	Improve access: salmon fish passes	X	X	X					X		
Sockeye salmon	11.3	Improve access: salmon fish passes									X	
Recreation	12.1	Construct New backcountry public facilities	X	X	X	X	X	X	X	X	X	
Recreation	12.2	Plan & Mkt new comm'l facilities on pub land	X	X	X	X	X	X	X	X	X	
Harlequin duck	13	Eliminate oil from mussel beds			X	X	X	X	X	X	X	
MULTI-SPECIES	14	Accelerate recovery of upper intertidal zone			X	X	X	X	X	X	X	
Common murre	17.2	Reduce predator access to colonies (murres)				X	X	X	X	X	X	
Pigeon guillemot	17.2	Reduce predator access (Pigeon Guillemot)	X	X	X	X	X	X	X	X	X	
Commercial Fishing	18	Replace salmon harvest opportunities	X	X	X						X	
Sport Fishing	18	Replace salmon harvest opportunities	X	X	X						X	
Subsistence	18	Replace salmon harvest opportunities		X	X						X	
Cutthroat/Dolly Varden Trout	19	Update anadromous fish stream catalogue		X	X							
Pink salmon	19	Update anadromous fish stream catalogue	X	X	X	X	X	X		X	X	
Subsistence	30	Test subsistence foods for oil contamination		X	X						X	
Research & Education	33.2	Design and construct a new visitor center	X	X	X	X	X	X	X		X	
Research & Education	34.1	Marine environmental insitute	X	X	X	X	X	X	X		X	
Research & Education	34.2	Fund a marine research prog or foundation										
Archaeology	35	Acquire replacements for artifacts from the spill	X	X	X	X	X	X	X	X	X	X
MULTI-SPECIES	37	Habitat protection and acquisition		X	X	X	X	X	X	X	X	
MULTI-SPECIES	40	Special designations	X	X	X	X	X	X	X	X	X	
Prevention	44	Spill prevention and contingency plannin	X	X	X	X	X	X			X	
Killer Whale - AB pod	45	Black cod fishery, feas stdy	X	X	X							
Harbor seal	46	Cooperative program with fishermen	X	X	X							
Harbor Seal &Sea otter	47	Cooperative program with subsistence users		X	X						X	
Pink salmon	48	Improve survaval rates of salmon eggs & juv.	X	X	X							
Sockeye salmon	48	Improve survaval rates of salmon eggs & juv.								X	X	
Subsistence	49	Provide subsistence users access		X	X						X	
Subsistence	50.1	Develop subsistence mariculture sites		X	X						X	
Subsistence	50.2	Develop bivalve shellfish hatchery and resc ctr				X	X	X				

RESOURCE OR SERVICE	Opt. No.	OPTION NAME	North	East	West	Kenai Ck In	Lower Ck In	Central Ck In	Alaska Penin.	Afg. Shuyak	Kodiak	Outside EVOS
Pink salmon	51	Relocate existing hatchery runs	X	X	X							

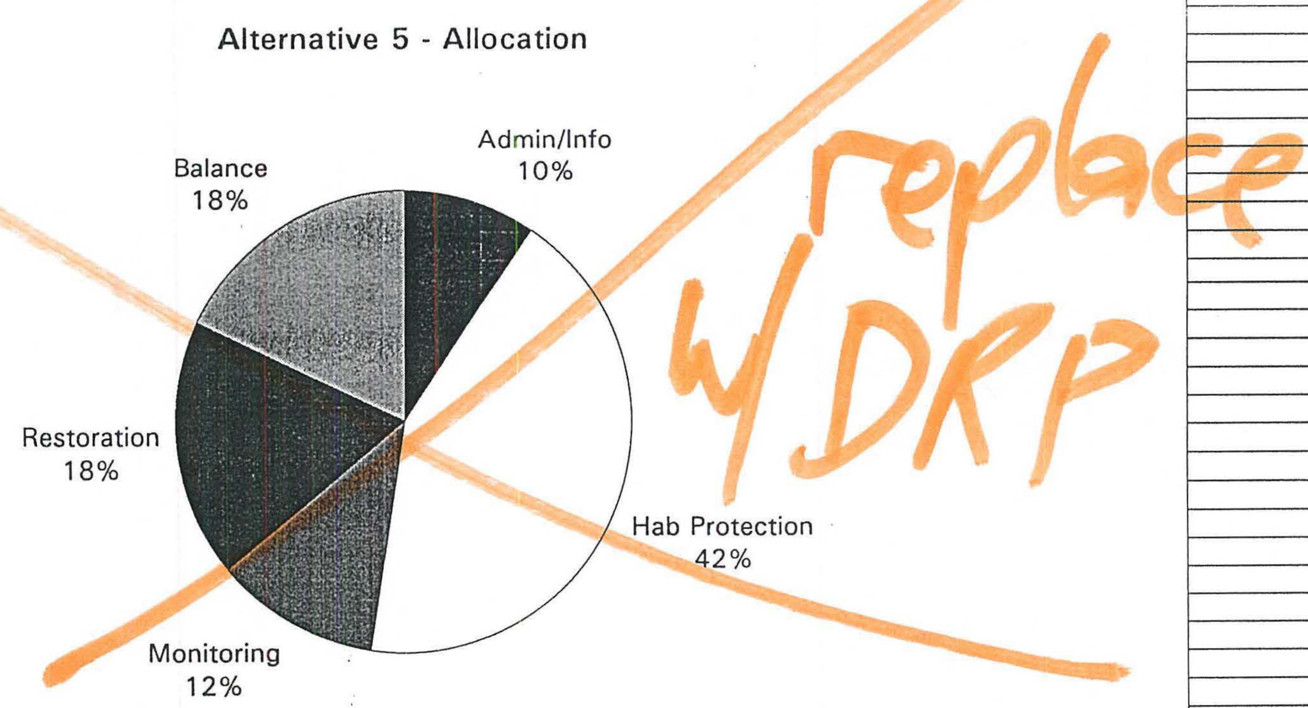
~~ALTERNATIVE #5~~

Table X. Expected Geographic Distribution of Options in Alternative #5 could be held for unanticipated expenses, such as injuries identified through the monitoring program, new options, or higher-than-projected costs for those already considered. Another use of the balance could be to fund an endowment for ongoing projects or for a research foundation. The estimated amount of the balance could yield about $2.6 million annually through an endowment.

V. PRIORITY

The theme of this alternative includes all beneficial restoration options for all levels of injury from the Exxon-Valdez oil spill. When addresses implementation, first priority is to be placed on restoration options that address species with population level injuries. We have identified these species and the proposed options by highlighting **first priority** after the resource name under the effectiveness in this Evaluation section.

Allocation of Remainder of Settlement Funds	Total $	%
Admin/Info	50190.0	10%
Hab Protection	225000.0	43%
Monitoring	60250.0	12%
Restoration	92606.0	18%
Balance	93954.0	18%



NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

Alternative 5 - Comprehensive Restoration													
							DURATION				TOTAL COST		
				ANNUAL COST				Years			10-Year Maximum		
Opt	DESCRIPTION	ResSvc	UNIT	Exp	Low	High	Type	E	L	H	Expected	Lower	Higher
1.10	Site stewardship program	Archaeology	Per 3 areas	195.0	195.0	195.0	Ltd	10	10	10	1950.0	1950.0	1950.0
1.20	Site patrol and monitoring	Archaeology		300.0	300.0	300.0	Ltd	4	3	5	1200.0	900.0	1500.0
2.10	Intensify management	Cutthroat/Dolly		145.0	130.0	160.0	Ltd	2	2	2	290.0	260.0	320.0
2.20	Intensify management	Pacific herring		457.0	457.0	457.0	Ltd	2	2	4	914.0	914.0	1828.0
2.30	Intensify management	Pink salmon		1200.0	900.0	1500.0	Ltd	2	2	4	2400.0	1800.0	6000.0
2.40	Intensify management	Rockfish		593.0	593.0	593.0	Ltd	2	1	4	1186.0	593.0	2372.0
2.50	Intensify management	Sockeye salmon		750.0	700.0	800.0	Ltd	5	2	5	3750.0	1400.0	4000.0
4.10	Reduce disturbance	Common murre									330.0	185.0	640.0
4.20	Reduce disturbance	Harbor seal									330.0	185.0	640.0
4.30	Study: Reduce disturbance	Sea otter					Ltd				120.0	80.0	640.0
4.40	Reduce disturb public info	Multiple resources		40.0	30.0	50.0	Ltd	1	1	1	40.0	30.0	50.0
4.50	Reduce disturb field presence	Multiple resources		438.0	390.0	486.0	Ltd	10	10	10	4380.0	3900.0	4860.0
8.10	Sport/trap harvest guidelines	Harlequin duck		15.0	10.0	30.0	UR	5	2	10	75.0	20.0	300.0
8.20	Sport/trap harvest guidelines	River otter		15.0	10.0	30.0	UR	5	2	10	75.0	20.0	300.0
9.00	Minimize incidental take	Marbled murrelet									1625.0	1100.0	2000.0
10.00	Archaeol Res Protection	Archaeology									4072.0	3250.0	7000.0
11.10	Salmon spawning channels	Pink salmon	9 total	579.0	579.0	579.0	Ltd	6	6	6	3474.0	3474.0	3474.0
11.20	Fertilize lakes	Sockeye salmon	Per lake	190.0	150.0	220.0	Ltd	3	1	5	570.0	150.0	1100.0
11.30	Fish passes	Pink salmon	5 passes	250.0	64.0	1900.0	Ltd	6	6	10	1500.0	384.0	19000.0
11.30	Fish passes	Sockeye salmon	2 passes	100.0	25.0	800.0	Ltd	6	6	10	600.0	150.0	8000.0
12.10	New backcountry rec facilities	Recreation									1620.0	480.0	3256.0
12.20	Pln/mkt comm rec facilities	Recreation		275.0	200.0	350.0	Ltd	1	1	1	275.0	200.0	350.0
13.10	Eliminate oil from mussel beds	Harlequin duck		491.0	340.0	641.0	Ltd	5	4	7	2455.0	1360.0	4487.0
13.20	Study: Elim oil fr mussel beds	Sea otter											
14.10	Accelerate recovery of UIT	Intertidal organisms		150.0	100.0	200.0	UR	5	4	7	750.0	400.0	1400.0
14.20	Accelerate recovery of UIT	Black oystercatchers											
16.10	Study: Social stimuli	Common murre					Ltd				850.0	800.0	5500.0
16.20	Study: Improve nest sites	Common murre					Ltd				850.0	800.0	5500.0
17.10	Eliminate introduced foxes	Seabird repl					UR				2500.0	1500.0	3500.0
17.21	Reduce predator access	Common murres		350.0	300.0	400.0	Ltd	5	5	10	1750.0	1500.0	4000.0
17.22	Reduce predator access	Pigeon guillemot		200.0	150.0	250.0	Ltd	4	4	6	800.0	600.0	1500.0
18.10	Replace harvest opportunities	Comm fishing	Per run	150.0	100.0	200.0	Ltd	2	1	5	300.0	100.0	1000.0
18.20	Replace harvest opportunities	Sport fishing	Per run	150.0	50.0	200.0	Ltd	2	1	5	300.0	50.0	1000.0
18.30	Replace harvest opportunities	Subsistence	Per run	150.0	50.0	200.0	Ltd	4	1	10	600.0	50.0	2000.0

NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

Opt	DESCRIPTION	ResSvc	UNIT	ANNUAL COST			DURATION				TOTAL COST 10-Year Maximum		
								Years					
				Exp	Low	High	Type	E	L	H	Expected	Lower	Higher
19.10	Anad Stream Catalogue	Cutthroat trout		100.0	100.0	100.0	Ltd	1	1	1	100.0	100.0	100.0
19.30	Anad Stream Catalogue	Pink salmon		100.0	100.0	100.0	Ltd	1	1	1	100.0	100.0	100.0
30.00	Test subsistence foods	Subsistence		330.0	300.0	350.0	Ltd	3	2	5	990.0	600.0	1750.0
33.00	Visitor center	Recreation	Per 5000 sf				Ltd				1000.0	750.0	1750.0
34.00	Marine environmental institute	Recreation									42000.0	42000.0	42000.0
35.00	Aquire archaeol. artifacts	Archaeology		225.0	150.0	300.0	Ltd	3	3	3	675.0	450.0	900.0
37.00	Habitat protection/acquisition	Multiple resources									225000.0	225000.0	350000.0
40.00	Special designation	Multiple resources											
44.00	Spill prevention/conting plng	Multiple resources					Ltd						
45.00	Study: Changes in black cod	Killer whale		30.0	30.0	30.0	Ltd	1	1	1	30.0	30.0	30.0
46.00	Coop prgm-fishermen	Harbor seal		50.0	30.0	100.0	Ltd	3	1	5	150.0	30.0	500.0
47.10	Coop prgm-subsistence users	Harbor seal		30.0	30.0	30.0	UR	10	10	10	300.0	300.0	300.0
47.10	Coop prgm-subsistence users	Sea otter					UR						
48.10	Improve survival rates	Pink salmon	Per run	400.0	200.0	600.0	Ltd	3	1	5			
48.20	Improve survival rates	Sockeye salmon	Per run	400.0	200.0	600.0	Ltd	3	1	5	1200.0	200.0	3000.0
49.00	Access to traditional foods	Subsistence		53.0	50.0	60.0	UR	10	10	10	530.0	500.0	600.0
50.10	Subsistence mariculture sites	Subsistence		200	180	220	Ltd	3	2	4	600.0	360.0	880.0
50.20	Bivalve shellfish hatchery etc	Subsistence		1000.0	1300.0	2500.0	Ltd	3	2	4	3000.0	2600.0	10000.0
51.00	Relocate existing hatchery runs	Pink salmon	Per run				Ltd	22	2	3			
P1.00	Administration	Multiple resources									50190.0	30180.0	50200.0
P2.00	Monitoring	Multiple resources									60250.0	20250.0	70250.0

NB: All costs are expressed in units of $1,000 (1993 $). The inflation-adjusted value of the remainder of the settlement is about $522 million.

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CHAPTER III. Injured Resources and Services

A. Background

This chapter presents information on the basic questions involving restoration:

- *What was injured by the spill?* The chapter describes the injuries caused by the spill.

- *What is the present status of recovery?* The chapter describes what scientists and agency managers know about the present status of recovery, and their expectations for the progress of natural recovery.

- *What, if anything, can be done to aid recovery?* In most cases, natural recovery is more effective than anything that society can do. Time and the natural healing powers of nature that will bring injured resources and services back to their pre-spill conditions. Yet, for some resources or services, there are restoration techniques that will help. For others, the best we can do is protect them further injury or stress and let them heal on their own. For each injured resource or service, this chapter describes the options for aiding natural recovery.

INJURY TO NATURAL RESOURCES

The civil settlement specifies that restoration funds must be used to restore injuries resulting from the *Exxon Valdez* oil spill. The settlement requires that the funds be spent to "restore...natural resources injured as a result of the oil spill and the reduced or lost services provided by such resources..."

Natural Resources are defined in the settlement as the "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to [or] managed by...the state or federal governments." For example, any injury to common murres are an injury to a natural resource.

A natural resource has experienced injury if it has sustained a loss (a) due to exposure to oil spilled by the T/V *Exxon Valdez*, or (b) which otherwise can be attributed to the oil spill and cleanup. Categories of injury are explained below.

Population-level injury. The most serious injuries are those that reduced the population of a natural resource in the oil spill area. For some species the deaths resulting from the oil spill have resulted in a lower population of that specie after the oil spill. For example, Murres were the most severely affected bird species, because several large colonies in the Gulf of Alaska lost 35 - 70%

of the breeding adults. The population of Murres in the oil spill area remains severely depressed because of the effects of the oil spill. Thus, it has suffered a population-level injury. The greater the percentage decrease in the population, the greater the injury.

Chronic or sublethal injury. A chronic or sublethal injury is an effect on one or more life stages of a species: for example, reduced survival in the eggs or larvae of a species. In many cases, a chronic or sublethal injury may not be reflected in an overall population loss to the species. However, injuries currently considered to be sublethal may decrease long-term survival for enough individuals to result in population reductions. There are a number of reasons why a sublethal or chronic injury may not result in a lower population. These include: the chronic or sublethal injury may not affect the productivity of the species, or the species may have some natural compensating mechanism for the injury. There also may be enough variability in the natural abundance of the species to mask any effect of the injury, or scientific measurement techniques may not be sensitive enough to measure the effect on the spill-area population.

Degradation of Habitat. The oil spill and cleanup altered and contaminated the flora, fauna, and physical components of the habitats of many species. This is most pronounced in the intertidal and subtidal areas. The continuing injury to plants and animals that exist below high tide continues to affect the many natural resources that use these habitats.

Direct mortality. Thousands of birds and lesser numbers of marine mammals, fish, shellfish, birds and other organisms were found dead after the spill. While this direct mortality is the most obvious injury caused the by oil spill, it is not always the most serious. Some species endured significant mortality without causing a long-term effect on the population. Examples include some migratory species caught in the path of the oil such as loons or grebes.

Our knowledge of the pre- or post-spill populations is imperfect, and in many cases, ecological relationships are unknown or unproven. In these cases, judgement concerning injuries to natural resources as a result of the oil spill will have to be determined by the weight of the evidence or best professional judgement.

INJURY TO NATURAL RESOURCE SERVICES

In addition to restoring injuries to natural resources, the settlement requires restoration funds to be used to restore reduced or lost **services** provided by injured natural resources. For example, recreation is a service that was damaged by injuries to fish and wildlife. Other damaged services include subsistence use of the natural resources, commercial and sport fishing, and the service that people enjoy from the damaged wilderness and intrinsic values of the spill-affected areas.

A natural resource service has experienced injury if the *Exxon Valdez* oil spill or clean up:

- has significantly reduced the physical or biological functions performed by natural resources, including loss of human uses; or
- has significantly reduced aesthetic, intrinsic, or other indirect uses provided by natural resources; or, in combination with either of these,
- has resulted in the continued presence of oil on lands integral to the use of special-purposes lands. (Special-purposes lands are those designated by the State of Alaska or the United States for the protection and conservation of natural resources and services. Examples are National or State Parks.)

This definition covers a wide range of potentially injured natural-resource services. Examples are commercial fishing, subsistence hunting, fishing, and gathering; wildlife viewing; sport fishing; recreation which includes a variety of activities, such as kayaking and backcountry camping; and wilderness values.

CONCEPTS IMPORTANT TO UNDERSTANDING RECOVERY

Natural Recovery. Natural recovery is the recovery that will occur without society's intervention. Many resources and services will recover to pre-spill levels without intervention. Others that were declining before the spill will continue to decline if present trends continue.

In a scientific sense, full ecological recovery has been achieved when the pre-spill flora and fauna are again preset, healthy and productive, and there is a full complement of age classes. A fully recovered ecosystem is one which provides the same functions and services as were provided by the pre-spill, uninjured system.

Rate or Degree of Recovery. The rate of recovery is the number of years that a resource or service will require until it returns to where it would have been in the absence of the oil spill. It is the length of time for a population to reach pre-spill levels (or for a declining species, to reach a population level that would have occurred in the absence of the oil spill). The length of time varies, depending on the species, from a few years to more than a hundred.

Some restoration options affect the rate of recovery. That is, they are not intended to change the long-term population level of the species, but they allow the species to achieve that level more quickly. For example, if it were possible to eliminate the residual oil in some mussel beds that may still be affecting

Option	Alternative 3 Targets	Alternative 4 Targets	Alternative 5 Targets
Option 14: Study extent of oiling of mussel beds and techniques for removing oil from mussel beds.	harlequin duck, sea otter	harlequin duck, sea otter	harlequin duck, sea otter
Option 15: Propose modifications of sport and trapping harvest guidelines of injured river otter and harlequin duck populations to speed the rate of recovery.			river otter, harlequin duck
Option 16: Develop a site stewardship program to monitor archaeological sites.	archaeological sites	archaeological sites	archaeological sites
Option 17: Preserve archaeological sites and artifacts within the spill area.	archaeological sites	archaeological sites	archaeological sites
Option 18: Acquire replacements for artifacts removed from the oil spill area.	archaeological artifacts	archaeological artifacts	archaeological artifacts
Option 19: Develop new public recreation activities.	protect existing recreation opportunities	protect or increase existing recreation opportunities	protect or increase existing recreation opportunities, encourage new use
Option 20: Test subsistence foods for continued contamination.	subsistence foods	subsistence foods	subsistence foods
Option 21: Provide new access to traditional subsistence foods in areas outside the spill area to replace lost use.	subsistence foods	subsistence foods	subsistence foods

D 513

indirectly affect intertidal organisms thorough the creation of recreation facilities that may adversely affect intertidal habitats that were previously undisturbed. Depending on the results of studies conducted under Options 12 and 14, these alternatives could have a high magnitude of impact on intertidal organisms.

Alternative 5 - Comprehensive Restoration

Under Alternative 5, the same options and impacts included in Alternatives 3 and 4 would be included. HP&A would also be included, but at a lower level of funding (35 percent). Additionally, Alternative 5 would include Option 22 to replace subsistence harvest of bivalve shellfish. This option could indirectly affect intertidal organisms by increasing their populations where bivalve mariculture feasible. Alternative 5 could have a high magnitude of impact on intertidal organisms depending on the results of studies under Option 12, and the feasibility of implementing Option 22.

Options Related to Intertidal Organisms

Option #19 (Create new recreation sites and facilities)

It is assumed that new recreation areas associated with the implementation of this option were not previously areas of high human activity. Consequently, construction of new recreational facilities could have an adverse, indirect, long-term effect on intertidal organisms because these facilities could contribute to increased use of a damaged areas that previously were little used or unused. Increased human use might include pollution, resource exploitation, trampling of sensitive vegetation, and disturbance of wildlife. This could slow the growth or reduce the number of organisms living in the damaged intertidal area.

Option #14 (Eliminate oil from mussel beds)

This option would produce a positive, direct, short-term effect on the mussel beds present on the intertidal environment by removing residual oil that is present in and adjacent to the mussel beds and reducing or eliminating the potential for further contamination of the mussels in the long-run. Consequently, less oil would be available for bioaccumulation by mussels and other invertebrates, and a positive, indirect effect would result to the health and safety of the predatory species (i.e., harlequin duck, black oystercatcher, sea otter, river otter) and humans (i.e., subsistence gatherers) that consume mussels. A direct, short-term, adverse effect would occur, in that, a minimal amount of mussels would be lost during the cleaning process; however, this effect would be a one-time event. This option would also include monitoring to assess the efficacy of stripping oil from mussel beds (i.e., the fate of oil in mussels and substrate, and the effects of oil on growth and reproduction of mussels). The effect from monitoring would be a positive, direct, long-term effect, because this knowledge would ensure more beneficial clean-up procedures in the event of future spills.

Option #12 (Accelerate recovery of upper intertidal zone)

Issue 3: What ecological change would occur in the spill area as a result of restoration activities?

The acquisition of private lands for habitat protection and the placing of public lands into special State and Federal land designations would promote only beneficial ecological change within the *EVOS* area. By enhancing the ecological integrity of the Greater *EVOS* Area Ecosystem, these activities would substantially promote the conservation of biodiversity. Therefore, implementation of habitat protection and acquisition (HP&A) under Alternatives 2 through 5 is the principal means for implementing ecosystem management and conserving biodiversity under the Restoration Plan. General restoration activities implemented under Alternatives 3, 4, and 5 would further enhance recovery of selected species toward natural ecological conditions.

As discussed in Chapter III, the physical and biological environment is better described as the Greater *EVOS* Area Ecosystem and includes the marine ecosystem, coastal ecosystem, and terrestrial ecosystem. All of the options could have some effect, although not always measurable or significant, on these ecosystems. Nonetheless, the cumulative effect of recovering resources constitutes a substantial benefit to the ecosystem. The relative benefits to biodiversity conservation within the Greater *EVOS* Ecosystem are presented below for each Alternative, and are subsequently discussed in more detail for individual restoration options.

Alternative 2 - Habitat Protection

Under this alternative, over 90 percent of the restoration funds would be used to implement habitat protection and acquisition. HP&A is the principal means for implementing ecosystem management within the restoration plan and would have a strong positive, direct, long-term effect on biodiversity conservation. Special land designations under HP&A would also implement ecosystem management measures, albeit on the smaller scale of existing public lands, and would have a moderate positive, direct, long-term effect on biodiversity conservation. The large amount of funding allocated HP&A under this alternative (the entire budget minus 10 percent for administration and public information, and monitoring and research) indicates that Alternative 2 would be implemented over a wide geographic extent and would include parcels totaling a large number of acres. Assuming that the acquisition of lands includes management in perpetuity for ecosystem integrity, the duration of this effect would be long-term. Because of these factors, the magnitude of the impact on biodiversity conservation of this alternative would be high.

Alternative 3 - Limited Restoration

Nearly all of the options in the restoration plan would affect biodiversity conservation to some extent. Options 1, 3, 4, 6, 7, 9, 10, 11, 13, 15, and 22 would have very slight to slight positive, indirect effects on biodiversity by contributing to population enhancement of individual species. Options 5 and 12 would have a greater positive effect on biodiversity by improving local habitat conditions for whole communities of organisms. Habitat alteration from the construction of recreational sites (Option 19) and the possible oversupply of salmon (Option 23) could have slight on biodiversity.

Under Alternative 5, the impacts of these general restoration options would be added to the strong positive effects of the habitat protection and acquisition. The more limited amount of funding allocated to HP&A (35 percent of the budget) indicates that this alternative would implement habitat protection and acquisition over a limited geographic extent and include parcels totalling a moderate number of acres. Assuming that the acquisition of lands includes management in perpetuity for ecosystem integrity, the duration of this effect would be long-term. The combination of slight benefits from general restoration options and a lesser amount of major benefits of habitat protection and acquisition would produce a moderate magnitude impact on biodiversity conservation for this alternative. The greater emphasis on increased human uses under Alternative 5 could reduce the positive impact on biodiversity conservation.

Options Related to the Greater *EVOS* Ecosystem

Because the goal of the Restoration Plan is to benefit resources and services within the Greater *EVOS* Ecosystem, each of the options makes some contribution to the conservation of biodiversity. In order to discriminate relative degrees of benefit to biodiversity, a set of ten biodiversity evaluation criteria was applied to each restoration option. These criteria are adapted from the recent Council on Environmental Quality (1993) document on incorporating the consideration of biodiversity into the NEPA process.

1. Does the option manage resources from a "big picture" or ecosystem perspective?

2. Does it protect communities and ecosystems?

3. Does it minimize fragmentation and promote the natural pattern and connectivity of habitats?

4. Does it promote native species and avoid introducing non-native species?

5. Does it protect rare and ecologically important species?

6. Does it protect unique or sensitive environments?

7. Does it maintain or mimic natural ecosystem processes?

8. Does it maintain or mimic naturally occurring structural diversity?

9. Does it protect genetic diversity?

10. Does it monitor for biodiversity impacts, acknowledge uncertainty, and retain flexibility in management?

Where possible, each option was evaluated in terms of its potential effect on the area of sensitive habitats, status of sensitive habitats, number of sensitive species, population status (including genetic composition) of sensitive species, and status of the landscape.

Special attention was also paid to the various degrees of linkage among the different species within the greater ecosystem. Although, some impacts may be small on individual resources, the combined impact on the ecosystem may be substantial. At the same time, the impacts of some options may be large for certain species within the ecosystems, but not significant for the ecosystem. Because of the complexity of interactions within an ecosystem, natural recovery should be encouraged wherever possible. At the same time, this approach must include diligent protection of the system from continuing and new impacts. In any case, long-term monitoring of the recovery process and effectiveness of restoration activities is essential.

HP&A (Habitat protection and acquisition)

HP&A involves private land acquisition, or acquisition of partial interests in private lands, for the purpose of protecting habitats linked to the resources injured by the oil spill or to prevent additional injury to those resources. Implementation may include the acquisition of critical upland habitat for injured species, such as undisturbed riparian lands around anadromous streams or nesting areas in mature forests. This option directly addresses biodiversity conservation in coastal and terrestrial ecosystems, and by extension marine ecosystems (which are linked through ecological processes and are especially vulnerable to degrading activities occurring in upland environments).

Special designation activities under HP&A also directly address biodiversity conservation. Marine, coastal, and terrestrial areas in public ownership can be placed into special State or Federal land designations that provide increased levels of regulatory protection. An important feature of special designations is that they can provide a regulatory basis for managing an area on an ecosystem level, with the primary objective of restoring spill injuries. Like habitat acquisition, special designations would promote biodiversity by maintaining ecosystem integrity. It could also enhance the recovery of injured resources, because their recovery may be substantially delayed or prevented by future development on private lands.

Both land acquisition and special designation activities address each of the biodiversity evaluation criteria described above. In fact, the habitat acquisition criteria (HAC) developed under the Restoration Plan for identifying parcels often parallel these biodiversity evaluation criteria. The following discussion describes how HP&A (and its habitat acquisition criteria) address each of these biodiversity evaluation criteria.

1. HP&A takes a "big picture" or ecosystem view of *EVOS* restoration as evidenced by HAC #2 (The parcel should function as an intact ecological unit or essential habitats on the parcel must be linked to other elements/habitats in the greater ecosystem).

2. HP&A directly protects communities and ecosystems by preserving land units rather than

managing individual species. HAC #4 (The parcel should benefit more than one species or service) is consistent with community rather than single species management.

3. HP&A could minimize fragmentation by uniting private parcels with lands already in protected status. This would promote the natural pattern and connectivity of habitats. The inclusion of HAC #6 in the parcel selection process (select vulnerable or potentially threatened areas) is evidence that without protection degradation of many parcels through logging, or other incompatible human uses, is imminent.

4. HP&A could promote native species and avoid introducing non-native species by transferring private lands into management programs that follow guidelines excluding exotic introductions.

5. Under HP&A, HAC #5 (the parcel should contain critical habitat for depleted, rare, threatened, or endangered species) explicitly includes protection of rare and ecologically important species. However, it is unlikely that individual parcels contain important for listed threatened or endangered species, or that the distribution of these species could be used to select parcels.

6. Under HP&A, HAC #1 explicitly states that selected parcels should contain essential habitats or sites, i.e., unique or sensitive environments. For example, old growth stands could be protected from logging through the acquisition of forested parcels.

7. HP&A could maintain natural ecosystem processes as evidenced by HAC #3 (adjacent land uses will not significantly degrade the ecological function).

8. Under HP&A, acquisition of prospective timber lands could help maintain naturally occurring structural diversity that would be lost through logging operations. Typically, logging simplifies natural forest pattern by reducing age classes and removing snags and downed wood.

9. HP&A could protect genetic diversity by maintaining the natural complement of subpopulations and individual variation within the ecosystem. In contrast, single species approaches to resource management can reduce genetic diversity of wild populations.

10. HP&A acknowledges the uncertainty inherent in ecosystem restoration. By maintaining a reservoir of natural areas, this HP&A could provide a benchmark for biodiversity monitoring and provide flexibility for future management decisions.

In summary, HP&A would have a strong positive, direct, long-term impact on the marine, coastal, and terrestrial ecosystems.

Option #1 (Reduce the bycatch of harbor seals) substances into new products. The materials and substances are produced by other sectors (e.g., agricultural, forests and fisheries) or other manufacturers.

5. Transportation, communication and utilities - These businesses provide to the public or to other businesses passenger and freight transportation, communication services, electricity, gas, steam, water or sanitary services. The U.S. Postal Service is included here.

6. Trade - These businesses retail merchandise to households or wholesale it to retailers; other wholesalers; to other businesses; or act as agents or brokers in buying or selling goods.

7. Finance, Insurance and Real Estate - These businesses engage in the fields of finance, insurance and real estate.

8. Services - These businesses provide a variety of services for individuals, businesses, governments, and other organizations. Examples include hotels, amusements, health, legal, engineering and other professional services.

9. Government - This sector includes the legislative, judicial, administrative and regulatory activities of Federal, State, local and international governments. Government-owned businesses are classified according to the activity in which they are engaged.

10. Misc. Special Services - These cannot be classified in any other industry.

For each Restoration Plan alternative, the amount of funds allocated for each expenditure is divided among restoration activities and the economic sector participating in those activities, as follows:

Administration and public information - Federal, State and local government

monitoring and research - Federal, State and local government and universities

General restoration - State and local government, private fisheries and construction

Habitat protection - Forestry, real estate, households

Respending of Habitat Protection - Securities, social services, construction, households

The last category "Respending of Habitat Protection" does not appear in the Summary. It is part of the modeling exercise. Habitat purchases put dollars in the hands of resource owners. This category specifies a spending pattern for these funds that saves/invests part (securities, construction) and consumes part (social services).

When preparing data for use as input in the IMPLAN economic model, several factors that are

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Organization Structure "Straw Dog"
Science Planning and Management
DRAFT 3/20/94

Restoration funds must be used "...for the purpose 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..." Thus, restoration and restoration monitoring activities must be linked to the injured resources. However, we have recognized that a single-species approach to restoration is not adequate. The first policy stated in the Draft Restoration Plan is that the restoration program will take an **ecosystem approach**; this group has reiterated the ecosystem approach as one of the guiding principles. The organization diagram presented here is an attempt to describe a management structure that works from the base of the injured resources to develop an integrated, ecosystem approach to accomplishing the goals of healthy ecosystem components. Monitoring, ecosystem research, and active restoration projects must address the specific needs of particular injured resources in the context of restoring a healthy ecosystem. To implement this, we are proposing injured resource Work Groups coordinated by an interdisciplinary team.

Injured Resources Work Groups

1.) Responsibilities

A. Identify strategies, research approaches, and testable hypotheses for monitoring, research, and general restoration.

a. Emphasis on integrated, interdisciplinary ecosystem approaches. SEA plan as an example.

b. Needed for guidance of FY-95 proposals and beyond.

B. Annual review of resource status and strategies for achieving restoration objectives.

C. Recommend priorities for research and restoration activities needed to achieve restoration objectives.

D. Ensure communication, cooperation, and integration

a. Within Work Group.

b. Determine representative for Interdisciplinary Team for communication with other Work Groups.

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2.) Composition

A. Scientists from resource disciplines, including PI's with projects for monitoring and restoration of the injured resources.

B. Scientists from other disciplines (e.g., oceanography, toxicology, ecosystem modeling).

C. Public participation. Meetings are open to the public and interested public are kept in the communication loop.

Interdisciplinary Team

1.) Responsibilities

A. Communication, coordination, and cooperation among Work Groups to ensure an integrated effort directed at restoration of injured resources and services and a healthy ecosystem.

B. Coordination of information from Work Groups on strategies, testable hypothesis, priorities, and progress towards restoration for review by the SRB and the Executive Director.

C. Coordination of activities with Restoration Work Force to facilitate agency administration and cooperation.

D. Coordination of Work Groups participation in annual workshops.

2.) Composition

A. Representatives from Work Groups.
- a. One representative from each Work Group.
- b. Executive Director must confirm selection.

B. One State and one Federal representative from the Restoration Work Force, appointed by the Executive Director.

C. Trustee Council Chief Scientist.

D. Public participation: Meetings open to the public.

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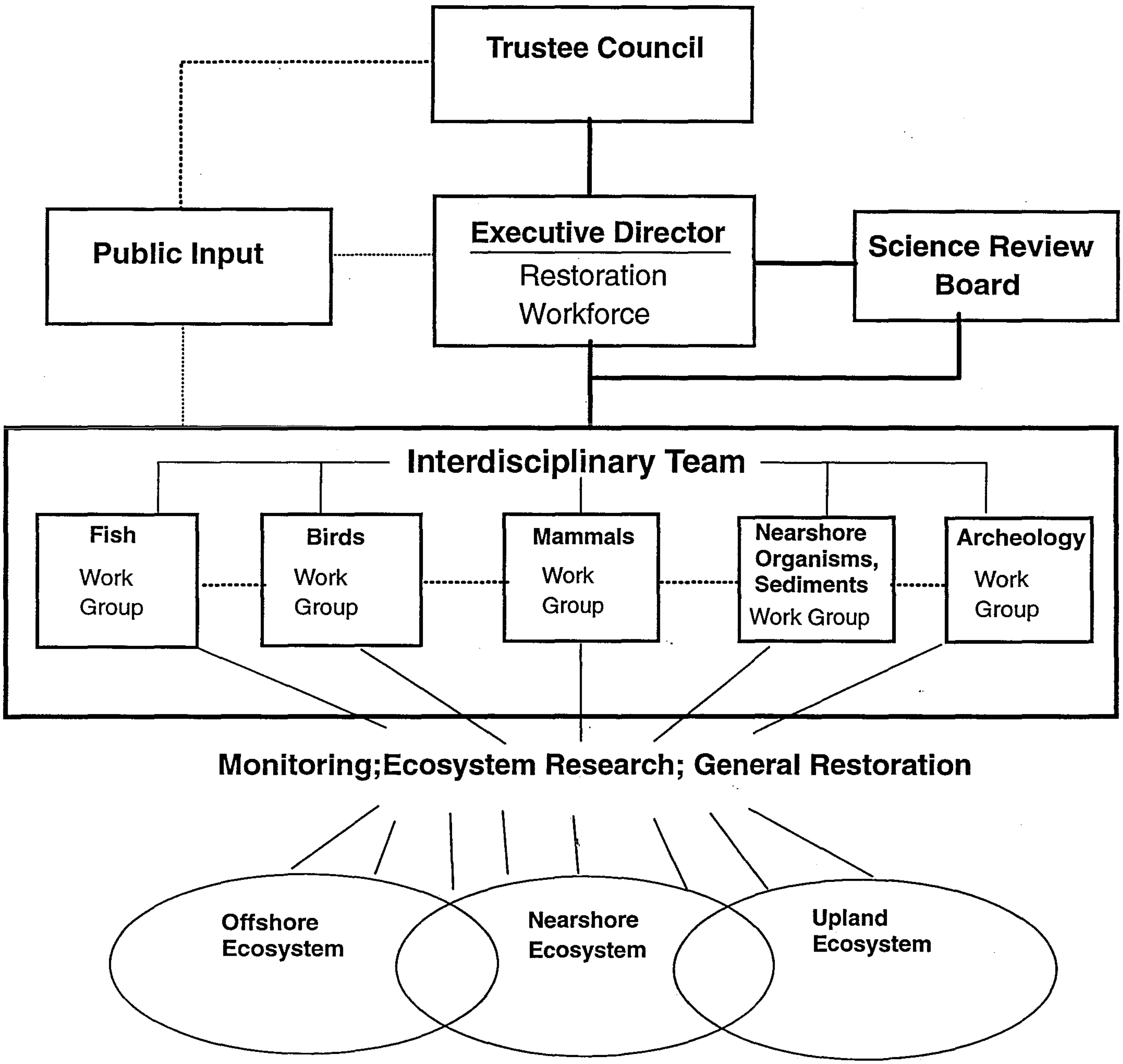
Organizational Diagram Science Planning and Management

(DRAFT 3/19/94)



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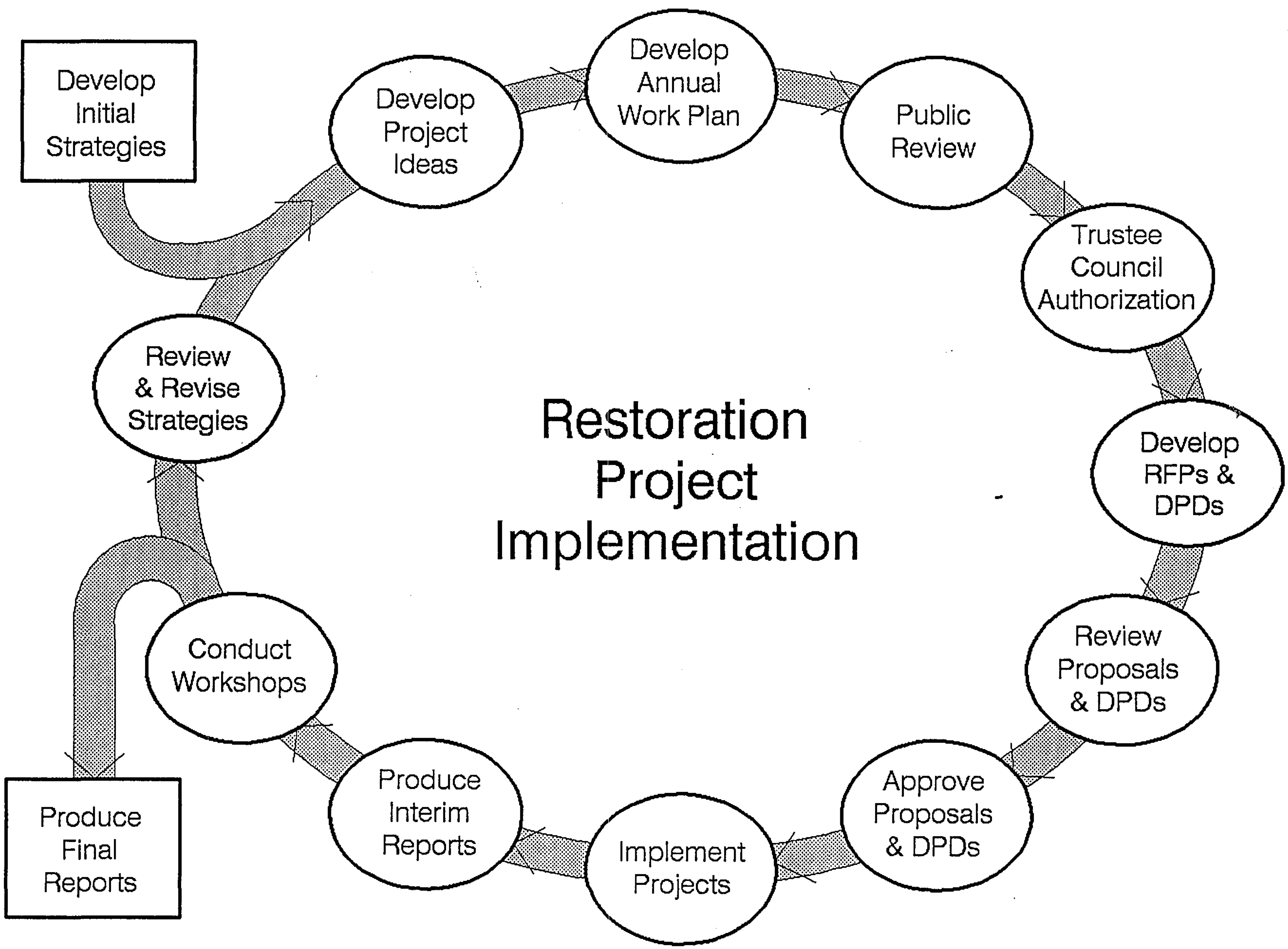

Restoration Project Implementation
Develop Initial Strategies
Develop Project Ideas
Develop Annual Work Plan
Public Review
Trustee Council Authorization
Develop RFPs & DPDs
Review Proposals & DPDs
Approve Proposals & DPDs
Implement Projects
Produce Interim Reports
Conduct Workshops
Review & Revise Strategies
Produce Final Reports

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Science Review Board

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Duties of the Board:

1. Recommend scientific priorities based on technical merit;
   A. Identify meritorious ideas and projects
   B. Recommend a prioritized list of ideas and projects
   C. Recommend resolution of conflicts between competing proposals
   D. Recommend the best proposal or combination of proposals for a given objective and/or project.

2. Assist in the development of an adaptive management process;
   A. Help integrate research and monitoring efforts
   B. Help the process run more efficiently and effectively
   C. Help synthesize study results and information from other sources
   D. Following review of results, recommend appropriate changes to ongoing and proposed work and identify new projects.

3. Review proposed, ongoing, and completed work;
   A. Review proposals
   B. Review project design
   C. Review project conclusions and reports.

4. Assist the Executive Director explain what has been done, what has been learned, and what needs to be done;
   A. Explain the effects of completed projects
   B. Explain how proposed projects aid restoration
   C. Explain how proposed projects affect the ecosystem.

Assumptions:

1. The Trustee Council makes decisions, the Science Review Board makes recommendations and presentations to the Executive Director and the Trustee Council as appropriate.

2. The Science Review Board primarily focuses on technical merit. Social issues and policy considerations should be incorporated by the Executive Director and Trustee Council.

3. Social objectives and policy are set by the Trustee Council. When appropriate, the Science Review Board will be requested to make recommendations on how to most efficiently and effectively implement those objectives and policies.

Printed: March 18, 1994

4. The Science Review Board will operate on a consensus basis with majority and minority reports on an issue when necessary.

5. Science Review Board members only work part time and are compensated appropriately.

6. Both compensated and uncompensated peer reviewers will be available to the Science Review Board as necessary to review proposals, project descriptions, and reports.

7. The Science Review Board will review Work Group product and make recommendations to the Executive Director and Trustee Council. Work Groups under the direction of the Executive Director and an Interdisciplinary Team will be set up for injured resources and services and/or appropriate categories (eg. terrestrial, nearshore, pelagic) to develop information on progress to date, testable hypotheses, research projects, and restoration implementation projects.

8. Science Review Board meetings will be open to the public.

9. Staff support will be provided by the Executive Director.

10. The Science Review Board will hold work sessions to synthesize research and monitoring information.

11. The Science Review Board will participate in an annual workshop which will be conducted to disseminate what has been learned and what projects and/or modifications of projects need to be considered for the coming year. The Board will also participate in development of the annual report to the public.

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Qualifications and Membership:

1. Members must be recognized experts in their field of expertise with proven track records, must have a multi-disciplinary approach to problem solving, and must have demonstrated professional integrity.

2. Since continuity is important, prior knowledge of this oil spill is desirable.

3. The Board will consist of six to eight members including the Chief Scientist and needs to cover the following disciplines:
   A. Archaeology
   B. Birds
   C. Ecotoxicology/chemistry
   D. Fish
   E. Intertidal/Subtidal
   F. Marine Mammals
   G. Oceanography

   Additional expertise on specific topics will be covered as necessary from appropriate sources.

4. The Chief Scientist will chair the Board (including calling meetings, setting agendas, and conveying results).

5. Members will be appointed by the Executive Director following consultation with the Chief Scientist, the agencies, and interested public and confirmed by the Trustee Council.

6. The Executive Director will conduct an annual performance review of the Science Review Board and submit a report with recommendations to the Trustee Council. Members will serve at the pleasure of the Trustee Council.

7. Members may not be contractually involved in the implementation of projects. Even the appearance of a conflict of interest must be avoided.

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Exxon Valdez Oil Spill Trustee Council

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March 3, 1994

Meeting Notes
January 13 & 14, 1994 Work Session
on
Ecosystem-based Management Structure

Mission Statement	Attachment 1
Definitions	Attachment 2
Guiding Principles	Attachment 3
Injured Resources and Services, and Ecosystem Goals and Objectives	Attachment 4
Management Goals and Objectives	Attachment 5

In January, we distributed draft notes and asked for review and suggestions. These revised notes include changes based on the suggestions we received. Some of the most important changes are: the Guiding Principles are grouped into categories for better communication and understanding, ecosystem definitions are provided for the three ecosystem types, and background information is provided that puts the goals and objectives into perspective.

ATTACHMENT 1

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 renown ecosystem, while taking into account the importance of the 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
- Efficient Administration

— adopted by the *Exxon Valdez* Oil Spill Trustee Council November 30, 1993

ATTACHMENT 2

GOAL

A mental concept of what you want.

OBJECTIVE

Pertaining to a material or measurable specific object (as distinguished from a mental concept).

STRATEGY

Activity or expenditure that is directed toward accomplishment of an objective (i.e., who, what, where, when, how).

CATEGORY OF RESTORATION STRATEGY

- Monitoring and Research
- Habitat Protection
- General Restoration

STRATEGY TIMELINE AND COSTS

ATTACHMENT 3

GUIDING PRINCIPLES

General Principles

1. Restoration should contribute to a healthy, productive and biologically diverse ecosystem within the spill area that supports the services necessary for the people who live in the area.

2. Restoration will take an ecosystem approach to better understand what factors control the populations of injured resources.

Principles that Focus or Direct Restoration Activities

3. Restoration will focus upon injured resources and services and will emphasize resources and services that have not recovered. Resources and services will be enhanced, as appropriate, to promote restoration. Restoration actions may address resources for which there was no documented injury if these activities will benefit an injured resource or service.

4. Resources and services not previously identified as injured may be considered for restoration if reasonable scientific or local knowledge obtained since the spill indicates a spill-related injury.

5. Projects designed to restore or enhance an injured service:
   - must have a sufficient relationship to an injured resource,
   - must benefit the same user group that was injured, and
   - should be compatible with the character and public uses of the area.

6. Restoration activities will occur primarily within the spill area. Limited restoration activities outside the spill area, but within Alaska, may be considered under the following conditions:
   - when the most effective restoration actions for an injured population are in a part of its range outside the spill area, or
   - when the information acquired from research and monitoring activities outside the spill area will be significant for restoration or understanding injuries within the spill area.

Principles Concerning Integration of Restoration Activities

7. Restoration will include a synthesis of findings and results, and will also provide an indication of important remaining issues or gaps in knowledge.

8. Restoration shall take advantage of cost sharing opportunities where effective.

9. Restoration should be guided and reevaluated as information is obtained from damage assessment studies and restoration actions.

Public Participation Principles

10. Restoration must include a meaningful public participation process at all levels — planning, project design, implementation and review.

11. Restoration must reflect public ownership of the process by timely release and reasonable access to information and data.

Principles concerning the Design of Restoration Projects

12. Proposed restoration strategies should state a clear, measurable and achievable end point.

13. Restoration must be conducted as efficiently as possible, reflecting a reasonable balance between costs and benefits.

Principles to Help Establish Priorities for Restoration Activities

14. Priority will be given to restoring injured resources and services which have economic, cultural and subsistence value to people living in the oil spill area, as long as this is consistent with other principles.

15. Possible negative effects on resources or services must be assessed in considering restoration projects.

16. Priority shall be given to strategies that involve multi-disciplinary, interagency or collaborative partnerships.

17. Restoration projects will be subject to open, independent scientific review before Trustee Council approval.

18. Past performance of the project team should be taken into consideration when making funding decisions on future restoration projects.

19. Competitive proposals for restoration projects will be encouraged.

20. Government agencies will be funded only for restoration projects that they would not have conducted had the spill not occurred.

These Guiding Principles reflect and elaborate on the Policies identified in Chapter 2 of the Draft *Exxon Valdez* Oil Spill Restoration Plan (November 1993). Further guidance regarding the categories of restoration action — General Restoration, Habitat Protection and Acquisition, Monitoring and Research, and Public Information and Administration — are provided in Chapter 3 of the Draft *Exxon Valdez* Oil Spill Restoration Plan (November 1993).

Attachment 4

This attachment organizes information on injuries and restoration according to general ecosystem types within the spill area, identifies resources and services injured by the spill, and provides a statement of goals and objectives for those resources and services.

Resources and services injured by the spill. The list of injured resources and services is taken from Appendix B of the Draft *Exxon Valdez* Oil Spill Restoration Plan (November 1993). As a result of the January 13-14 work session, the information was modified by subdividing some resource categories:

- "mussels" was made its own category rather than being included in "intertidal organisms," and
- "intertidal ecosystem" and "subtidal ecosystem" were subdivided into "organisms" and "sediments."

In order to make the ecosystem context more apparent, each resource and service is shown according to where it exists in the ecosystem: pelagic (offshore), near-shore, or upland ecosystem.

Goals. Draft goals are provided for each of the three parts of the ecosystem.

Objectives. Objectives are statements that pertain to a measurable, specific object (as distinguished from a mental concept). They are given for each injured resource and service, and are taken from definitions of recovery in Chapter 4 of the Draft Restoration Plan.

Ecosystem Definitions. The three ecosystem types described below are not intended to have hard-and-fast, legally definable boundaries. Rather, they are intended to describe areas that generally contain similar biological and physical features that influence the relationships of the resources that exist there and the services they support.

Pelagic Ecosystem. The deeper, open water region offshore that is not directly affected by wave action, terrestrial runoff, or other near-shore processes. Examples are the center of Prince William Sound and a few hundred yards beyond the steep cliffs and fiord mouths of the outer Kenai coast.

Near-shore Ecosystem. Terrestrial and aquatic areas dominated by near-shore processes such as tidal movement, salt spray, intertidal and shoreline vegetation, wave action, and terrestrial runoff. Near-shore areas include the intertidal zone, salt marshes, and beach areas where salt and shoreline processes dominate, as well as shallower offshore waters that are greatly influenced by near-shore processes. It also includes narrow fjords and channels that occur in the spill area.

Upland Ecosystem. The area of land and water uphill of the near-shore ecosystem.

INJURED RESOURCE — ECOSYSTEM MATRIX

	ECOSYSTEM		
	Pelagic (Off-shore)	Near-shore	Upland
Harbor seal	X	X	
Sea otter		X	
Killer whale	X		
Sockeye salmon	X	X	X
Cutthroat trout		X	X
Dolly Varden		X	X
Rockfish	X	X	
Pacific herring	X	X	
Pink salmon	X	X	X
Common murre	X	X	
Harlequin duck		X	X
Marbled murrelet	X	X	X
Pigeon guillemot		X	
Bald eagle		X	X
Black oystercatcher		X	X
River otter		X	X
Clams		X	
Mussels		X	
Intertidal organisms		X	
Subtidal organisms	X	X	
Sediments	X	X	
Other Resources			
Archeological Resources		X	X
Designated Wilderness		X	X

ATTACHMENT 4 (continued)

INJURED RESOURCES

Pelagic (Off-shore) Ecosystem

Sockeye salmon
Pink salmon
Pacific herring
Rockfish
Killer whale
Harbor seal

Common murre
Marbled murrelet

Subtidal organisms
Sediments

Near-shore Ecosystem

Sockeye salmon
Pink salmon
Cutthroat trout
Dolly Varden
Pacific herring
Harbor seal
Sea otter
Clams
Mussels
Pigeon guillemot
Rockfish

Archaeologic resources

Bald eagle
Harlequin duck
Black oystercatcher
River otter
Intertidal organisms

Subtidal organisms

Marbled murrelet
Sediments
Common murre

Designated wilderness areas

Upland Ecosystem

Sockeye salmon
Pink salmon
Cutthroat trout
Dolly Varden

River otter

Harlequin duck
Marbled murrelet

Bald eagle
Black oystercatcher

Archeological resources

Designated wilderness areas

LOST OR REDUCED SERVICES

Commercial fishing
Recreation/Tourism

Passive uses
Subsistence

GOALS

Pelagic (Off-shore) Ecosystem: A heathy, productive, pelagic (off-shore) ecosystem that supports resources and services injured by the oil spill, and that maintains naturally occurring biodiversity.

Near-shore Ecosystem: A heathy, productive, near-shore ecosystem that supports resources and services injured by the oil spill, and that maintains naturally occurring biodiversity.

Upland Ecosystem: A heathy, productive, upland ecosystem that supports resources and services injured by the oil spill, and that maintains naturally occurring biodiversity.

OBJECTIVES

(In the table below, the first column shows the ecosystem to which the objective applies: P=pelagic (off-shore) ecosystem, N=near-shore ecosystem, and U=upland ecosystem.)

The overall goal of restoration is recovery of all injured resources and services. Ecosystem goals are described above. This section defines objectives as measures of recovery to meet the overall restoration goal and ecosystem goals. For some resources, little is known about the extent of injury and recovery, so it is difficult to define recovery or develop restoration strategies.

In general, resources and services will have recovered when they return to conditions that would have existed had the spill not occurred. Because it is difficult to predict conditions that would have existed in the absence of the spill, recovery is often defined as a return to prespill conditions. For resources that were in decline before the spill, like marbled murrelets, recovery may consist of stabilizing the population at a lower level than before the spill.

Where little prespill data exists, injury is inferred from comparison of oiled and unoiled areas, and recovery is usually defined as a return to conditions comparable to those of unoiled areas. Because the differences between oiled and unoiled areas may have existed before the spill, statements of injury and objectives for recovery based on these differences are often less certain than in those cases where prespill data exist. However, there can also be some uncertainty associated with interpreting the significance of prespill population data since populations undergo natural fluctuations. Indicators of recovery can include increased numbers of individuals, reproductive success, improved growth and survival rates, and normal age and sex composition of the injured population.

Natural Resources

N, U **Bald Eagle:** Bald eagle population and productivity comparable to prespill levels.

N, U **Black Oystercatchers:** Populations that attain pre-spill levels, and reproduction and growth rates in oiled areas that are comparable to those in unoiled areas.

N **Clam:** Clam populations and productivity that are at prespill levels.

P, N **Common Murre:** Prespill populations and fledgling productivity of common murres at all injured colonies.

P, N, U **Cutthroat Trout and Dolly Varden Trout:** Growth rates and survival for cutthroat trout and Dolly Varden trout within oiled areas that are comparable to those for unoiled areas.

N, U **Harbor Seal:** Population trends in harbor seals that are stable or increasing.

N, U **Harlequin Ducks:** For harlequin ducks, prespill populations or when differences between oiled and unoiled areas are eliminated.

N **Intertidal Organisms:** For each intertidal elevation (lower, middle, and upper), community composition, age class distribution, population abundance of component species, and ecosystem functions and services at levels that would have prevailed in the absence of the oil spill.

P **Killer Whale:** Recovery of the injured AB killer whale pod to the 1988 level (of 36 individuals).

P, N, U **Marbled Murrelet:** Population trends in marbled murrelets that are stable or increasing.

N **Mussel:** Mussel populations and productivity which are at prespill levels, and which do not contain oil that contaminates higher trophic levels.

P, N **Pacific Herring:** Populations of pacific herring that are healthy and productive and exist at prespill abundances.

P, N **Pigeon Guillemot:** Population trends in pigeon guillemots that are stable or increasing.

P, N, U **Pink Salmon:** Populations of pink salmon that are healthy and productive and exist at prespill abundances. (An indication of recovery is when egg mortalities in oiled areas match prespill levels or levels in unoiled areas.)

N, U **River Otters:** For river otters, population levels are unknown but indications of recovery are when use and physiological indices have returned to prespill conditions.

P **Rockfish:** Populations of rockfish levels are unknown, but indications of recovery are when habitat use and physiological indices have returned to prespill conditions.

N, U **Sea Otter:** A population abundance and distribution of sea otters comparable to prespill abundance and distribution, and when all ages appear healthy.

P, N **Sediments:** Sediments whose contamination, if any, causes no negative effects to the spill-affected ecosystem.

P, N, U **Sockeye Salmon (Kenai River):** Population of sockeye salmon (Kenai River) that is healthy, and productive and exists at prespill levels. (One indication of recovery is when Kenai and Skilak Lakes support sockeye smolt outmigrations comparable to prespill levels.)

P, N, U **Sockeye Salmon (Red Lake):** Population of sockeye salmon (Red Lake) that is healthy, productive, and exists at prespill levels in Red Lake.

P, N **Subtidal Organisms:** For subtidal organisms, community composition, population abundance and age distribution of component species, and ecosystem functions and services in each injured subtidal habitat that have returned to levels that would have prevailed in the absence of the oil spill.

Other Resources

N, U **Archaeological Resources:** For archaeological resources, an end to spill-related injury including looting and vandalism rates that are at or below prespill levels.

N, U **Designated Wilderness Areas:** Designated wilderness areas where oil is no longer encountered, and when the public perceives them to be recovered from the spill.

Services

Subsistence: Subsistence resources that are healthy and productive and exist at prespill levels, and people that are confident that the resources are safe to eat. (One indication that recovery has occurred is when the cultural values provided by gathering, preparing, and sharing food are reintegrated into community life.)

Commercial Fishing: Population levels and distribution of injured or replacement fish used by the commercial fishing industry match conditions that would have existed had the spill not occurred. Because of the difficulty of separating spill-related effects from other changes in fish runs, the Trustee Council may use prespill conditions as a substitute measure for conditions that would have existed had the spill not occurred.

Recreation and Tourism: Recreation and tourism fish and wildlife resources that are recovered; recreation use of oiled beaches that is no longer impaired, and management capabilities and facilities that can accommodate spill-related changes in human use.

Passive Use: A public that perceives that aesthetic and intrinsic values associated with the spill area are no longer diminished by the oil spill.

Attachment #5

MANAGEMENT PROCESSES

This attachment lists a goal and four objectives for management processes.

GOAL

A long-term, comprehensive and cost-effective restoration program comprised of integrated strategies that are a balanced combination of Monitoring and Research, Habitat Protection and General Restoration.

OBJECTIVES

Administration: Administrative costs that average no more than five percent of overall restoration expenditures over the remainder of the settlement period.

Integrated Research and Monitoring : A research and monitoring program that coordinates project development and design with goals and objectives; appropriately reflects and addresses ecosystem relationships; and ensures that collected data will be readily available and accessible to resource managers, policy makers and the general public.

Information Management: Information that is available in a timely manner and useable format to scientists, managers and the public.

Communication: A public involvement program that provides information and an opportunity for meaningful involvement in all levels of restoration — planning, project design, implementation, and review.

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Oct '93

UAF
Ray Highsmith

EIS

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February 15, 1994 Author: John Strand/Art Weiner

OPTION Accelerate Recovery of Upper Intertidal Zone

APPROACH CATEGORY Manipulation of Resources

INJURED RESOURCES AND SERVICES Upper intertidal community of algae and invertebrates (upper *Fucus* zone).

SUMMARY

Much of the upper intertidal zone within the oil spill area was heavily oiled and subjected to intense clean-up. This zone is dominated by the brown alga, *Fucus gardneri* (popweed), which has been slow to recover. Moreover, many of the other life forms that use the upper intertidal zone are dependent upon *Fucus* for both cover and food. The scientific literature documents that *Fucus* is slow to recover and that its recovery affects the recovery of the rest of the intertidal community. It is the objective of this restoration option to establish ways of accelerating the recovery of this important habitat and to evaluate the long-term effects of various clean-up techniques used during the oil spill. Conclusions derived from this program may have significant bearing on clean-up decisions for future oil spills.

DESCRIPTION

It will be the objective of this option to test several promising approaches of accelerating the rate of recovery of *Fucus* assemblages. These include a trickle irrigation system to enhance moisture retention in the upper intertidal during low tide periods to protect new recruits, 2) a biodegradable substratum modifier made of hemp rope or fabric which is designed to provide additional substrate for germling attachment, and 3) cobble assemblage transplants of adult plants. The proposed feasibility study will include an analysis of cost versus benefit. Studies also will be conducted to determine the causes of variable recruitment. Additionally, monitoring will be conducted to follow the long-term recovery in relation to the different cleanup technologies used during the spill.

IMPLEMENTATION ACTIONS

1) Evaluate and implement cost-effective ways to accelerate the recovery of the upper *fucus* zone, and

2) Design and implement a monitoring program that will assess:

   a) the efficacy of several candidate approaches to accelerating recovery of *Fucus*, and

b) the role of important physical, chemical and biological factors affecting recovery of *Fucus*.

c) the effects of various methods used to remove oil from the upper intertidal zone following the oil spill.

TIME NEEDED TO IMPLEMENT

Two additional field seasons will be required to test the feasibility of the several potential restoration approaches to accelerate recovery of the *Fucus* zone. Assuming proven feasibility, implementation of one or more of these restoration approaches at three to five of the most severely damaged areas will occur over three additional field seasons. Monitoring will be continued over the entire five year period, but will likely be reduced in frequency thereafter.

In 1990, research was initiated aimed at developing a better understanding of the underlying mechanisms limiting *Fucus* populations (De Vogelaere and Foster 1990; Houghton et al. 1991, Highsmith et al. 1991[?]; perhaps others). These studies included an evaluation of important abiotic and biotic factors (rugosity of substrate, canopy shading and presence/absence of local adults, etc.) affecting recruitment of *fucus*. Monitoring the recovery of *Fucus* in relation to the quantity of residual oil in the upper intertidal zone also was undertaken. Additionally, preliminary experiments were conducted on the feasibility of using cobble assemblage transplants to accelerate recovery.

MEANS TO IMPROVE RECOVERY

By understanding the causes for variation in recovery rates among study sites following the *EXXON Valdez* oil spill, methods to enhance *Fucus* restoration should become more clear. Additionally, by comparing recovery in areas where either the method or intensity of cleaning differed, it should be possible to assess the relative benefits of effectively removing oil versus *Fucus* recruitment potential.

PROTECTION AND MANAGEMENT UNDER EXISTING LAWS

A measure of protection and management is afforded by the Coastal Zone Management Act of 1972 (Section 315, Public Law 92-583, as amended; 86 Stat. 1280 [16 U.S.C. 1461]) and the Alaska Coastal Management Act and Alaska Coastal Management Act Regulations (AS 46.40, 6 AAC 80 and 85).

RELATIONSHIPS WITH EXISTING/PLANNED USES OR MANAGEMENT

Knowledge gained by implementing Restoration Option 14 may be useful in making decisions on whether or not to physically or

chemically (includes bioremediation) remove sources of persistent contamination in or near nussel beds and other biologically important areas.

TECHNICAL FEASIBILITY

While approaches to monitor the long-term effects of various clean-up techniques used during the spill are available and have been implemented in some oiled and cleaned areas, additional research is required to test the feasibility of several potential restoration approaches to accelerate recolonization of *Fucus*.

POTENTIAL TO IMPROVE RECOVERY OF ENHANCE THE RESOURCE/SERVICE

It is reasonable to assume that if a new *Fucus* canopy can be established, other seaweeds, invertebrates and even terrestrial animals will be afforded a suitable habitat and/or source of food. It also has been observed that new *Fucus* plants are more likely to recruit in rock cracks, other rough surfaces and not on tar or bare rock; and the presence of adult *Fucus* enhanced local recruitment. Restoration approaches based on these research results could significantly increase the rate of *Fucus* recovery.

INDIRECT EFFECTS

There need be no adverse environmental, socio-economic and human health and safety effects associated with this option, however, the potential for such effects will be addressed in environmental assessments or environmental impact statements at the project level. As already stated, this approach has every potential to benefit a wide variety of plants and animals found in the intertidal zone. Construction will be kept to a minimum, and research (habitat manipulation) will not further degrade the integrity of the intertidal ecosystem. Where possible, monitoring will be conducted using non-destructive and the least intrusive methods available.

RELATIONSHIP TO OTHER EVOS RESPONSE/RESTORATION ACTIONS

Option 13, although focused directly on elimination of residual contamination, also is designed to accelerate recovery of the intertidal zone. The monitoring component of this option will be integrated with the comprehensive monitoring plan described in Option 31.

OTHER OPTIONS THAT COULD ACHIEVE THIS SAME OBJECTIVE

There are no other restoration options that propose direct restoration (manipulation) of the *Fucus* community.

LEGAL CONSIDERATIONS

The State of Alaska Department of Natural Resources has regulatory authority for all tidelands of the State. The State of Alaska Department of Fish & Game manages fish and wildlife including non-game species. Both agencies require and issue permits for scientific work in the intertidal zone. Other permits may be required by the U.S. Forest Service, National Park Service or the Alaska State Parks System, dependent upon the site(s) of the proposed feasibility studies.

MEANS TO EVALUATE SUCCESS

This option includes a monitoring component designed to assess the efficacy of several methods used to accelerate recovery of *Fucus* in the high intertidal zone. Also, monitoring growth and survival in relation to rugosity of substrate, canopy shading and presence/absence of adult plants, etc., will allow a better understanding of the factors and/or mechanisms affecting recovery.

REPRESENTATIVE COSTS

As shown in TABLE 1, expected costs for Year 1 will be $148.50K. With a 10% escalation, expected costs for Year 2 will be $163.85.

ADDITIONAL INFORMATION NEEDED

None.

CITATIONS

De Vogelaere, A. P. and M. S. Foster. 1990. Status Report: Fucus Restoration Project. University of Alaska, Fairbanks Contract No. 53-0109-9-00276 Mod #4. Moss Landing Marine Laboratories, Moss Landing, CA.

Houghton, J. P., D. C. Lees, H. Teas, III., H. L. Cumberland, S Landino, and T. A. Ebert. 1991. Evaluation of the Condition of Intertidal and Shallow Subtidal Biota in Prince William Sound following the *Exxon Valdez* Oil Spill and Subsequent Shoreline Treatment. NOAA WASC Contract Nos. 50ABNC-0-00121 and 50ABNC-0-00122. NOAA, Hazardous Materials Response Branch, Seattle, WA.

Others

TABLE 1. Projected Costs of Implementing Option 14.

ITEM	$K	BASIS

Year 1

Salaries		
Project Leader	35.00	6 man months over 1 year.
Technician	20.00	6 man months over 1 year.
Clerical Support	6.00	2 man months over 1 year.
Travel	12.50	Airfare to and from Alaska from lower 48 for two researchers, to include per diem for two month field season.
Boat Charter	28.00	For two month field season.
Equipment/Supplies	17.00	Sampling gear, PVC, fabric,
Chemical Analysis	25.00	Petroleum hydrocarbons
Publication	5.00	Report duplication, graphics support, editing, page charges (journal), mailing.
Sub-Total	$148.50K	

Year 2

Essentially same effort extended over same period of time but with a 10% escalation applied.

Sub-Total	$163.85K
Total	$312.35K

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Exxon Valdez Trustee Council

1993 Shoreline Assessment

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Project 93038

Lead agency:

Alaska Department of Environmental Conservation

Participating agencies:

United States Forest Service
Alaska Department of Natural Resources
National Marine Fisheries Service

Advisory agencies:

United States Department of the Interior
Alaska Department of Fish and Game
United States Coast Guard

Ernest Piper, Project manager
James C. Gibeaut, Ph.D., Consulting Geologist

Clara S. Crosby
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Marianne Profita

November 30, 1993

1.0 Executive summary

DRAFT

The 1993 shoreline assessment team conducted ground surveys and transect surveys at 59 sites in western Prince William Sound from Perry Island in the north to Latouche and Elrington Islands in the south. The team looked at an additional 20-25 sites requested for survey by the public. All sites were originally oiled in 1989 following the Exxon Valdez oil spill. The 1993 field work began June 4 and ended September 27.

- Oil residue — either surface or subsurface — was present at every one of the 59 study sites, and sheening occurred at some.

- Surface oiling has become very stable. There was no measurable reduction in surface asphalt and surface oil residue from 1992 to 1993.

- Oiling was not continuous throughout the study sites.

  — Within the 59 study sites, the 1993 survey discovered 109 distinct areas with visually detectable subsurface oil. The areas of these sites ranged from four square meters to several thousand square meters, with varying percentages of oil coverage.

  — Also within the 59 study sites, the survey documented 69 distinct areas of subsurface oiling that could be described as high oil residue or oil saturated sediments, the two heaviest types of concentration. Total estimated volume of this heavily oiled sediment is 738 cubic meters.

- Subsurface oiling overall has decreased substantially since 1991.

  — *Overall,* the amount of subsurface oil found at the study sites in 1993 is about 45 percent of the amount found in the same areas in 1991.

— The change at certain *individual* sites is probably greater. The 45 percent figure is probably a low-end number because we actually located more extensive oiling in 1993 than the crew did in 1992. So, while in fact subsurface oiling appears to be *decreasing,* some sites in 1993 will show an *increase,* only because we did a better job of finding the oil. This also dragged down the total rate of change for all sites.

• High-energy sites contain the greatest amount of subsurface oil remaining in 1993.

— This is probably because the high energy sites have more porous substrate and could absorb more oil at the outset.

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— Cleanup strategies, such as leaving high-energy sites to be "cleaned" naturally after a certain point, may also have played a part in this.

• Moderate energy sites have shown the least amount of reduction.

• The heaviest concentrations of oil seem to be dispersing at a faster rate than moderate or light concentrations.

— The areas with the heaviest concentrations of oil in 1991 showed the greatest rates of reductions by 1993.

— While differing natural rates of dispersion for heavy and moderate concentrations cannot be ruled out, the more rapid reductions of heavy oil is probably related to the fact that these sites were targeted for cleanup more often than other sites.

• Cleanup effects are becoming more apparent, in terms of oil reductions over time.

— Sites that were heavily tilled or had significant sediment removal in 1991 had slightly higher rates of subsurface oil reduction by 1993 than those that were not worked aggressively.

- Three possible cleanup tasks the Trustee Council may consider are:

    1. Manual remediation of stable surface oiling at sites near Chenega Bay;

    2. Manual remediation of mussel beds, pending results of NOAA restoration studies of this problem;

    3. Removal of rebar, flagging, signs, stakes, and other marking tools left by scientists and cleanup crews at sites around the oiled zone.

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2.0 Background

The 1993 draft restoration work plan included a brief description of a shoreline assessment project that could involve remediation in the area affected by the Exxon Valdez oil spill and cleanup. The scope of the project was refined somewhat by the lead agency, the Alaska Department of Environmental Conservation, during January-February 1993.

In March, the department submitted the project outline to the National Oceanic and Atmospheric Agency for review under the provisions of the National Environmental Policy Act. DEC requested and received a categorical exemption for the project due to its short duration, limited logistical needs, and its status as a general research project. This allowed the project to proceed without an environmental assessment or environmental impact statement.

On May 18, 1993, the Trustee Council decided to proceed with a shoreline assessment based generally on previous surveys conducted by the state and federal government with Exxon during the response to the oil spill from 1989-1992. The Trustees also voted to invite the U.S. Coast Guard and an Exxon observer to participate in the assessment with the trustee agencies and private landowners in the area.

Project staff prepared a detailed project description and submitted it to the Restoration Team and the Chief Scientist for review on May 28. After comment from the agencies, the plan was approved by both the Restoration Team and the chief scientist. Field work began during the first week in June.

2.1 Funding

The Trustees had allocated up to $520,700 for the project, but added an additional $15,000 in spending authority to cover transportation and associated costs incurred by the U.S. Coast Guard during its participation in the assessment.

Exxon was responsible for its own labor and transportation costs to and from Anchorage. Although the civil settlement allowed Exxon to deduct its expenses in 1991-92 from future payments to the trust fund, that was not the case in 1993, since the settlement covered Exxon's *response* costs only, and this project was under the restoration regime. Exxon, like all assessment participants, was provided with transportation to and from the home port or the work area, plus berthing space and food on the research vessel.

Actual total expenditures will probably come to considerably less than the $520,700 budgeted for the project. At this writing (November 1993), all the bills have not come in and all the accounting has not been completed, but preliminary estimates put the total expenditures at roughly $330,000 - $350,000.

2.2 Authority

The project was led by the Alaska Department of Environmental Conservation and included both the Cost Guard and Exxon, however, authorities and roles for all were different than during the response phase.

Neither the DEC nor the Coast Guard was operating under their pollution control authorities based in state and federal law. During the response, these agencies led assessments designed to guide specific remediation action on the shorelines oiled during the spill. The guidelines for remediation were grounded in state and federal statutes and rules that say, essentially, that cleanup shall continue until technology has reached its limit, or until continued cleanup is more environmentally disruptive than leaving the pollution in place. (The Coast Guard, in addition, has some more explicit guidelines regarding the cost-effectiveness of a given remediation action.)

That was not the case in 1993. The response phase ended in June 1992, and authority for any actions on shorelines affected by the spill devolved to the various trustee agencies. The DEC project manager coordinated the effort, but did not carry the same kind of broad authority as an on-scene coordinator; he was, rather, operating as a general coordinator for the Trustee Council agencies, which were in turn assessing shoreline conditions as they might relate to specific agency management or restoration goals. The DEC was designated lead agency largely because it was the only trustee agency that had detailed cleanup information area-wide. The Coast Guard was serving as a technical advisor, and because the Coast Guard personnel assigned to the project had additional detailed knowledge of the response. Exxon was invited for similar reasons.

2.3 Development of methods and objectives

In approving a shoreline assessment for 1993, the Trustee Council made clear that it wished the project to follow as closely as possible the methods and data reporting systems used during the response.

Therefore, the DEC oil spill response staff selected sites for assessment based on the last reported oiling conditions. The initial list of 52 shoreline segment subdivisions included 40 of the subdivisions that had appeared on the 1992 Final Shoreline Assessment Project (known as FINSAP) conducted jointly by the DEC, the Coast Guard, and Exxon. An additional 12 sites were included because of distinctive oiling or cleanup conditions, proximity to high-priority or well-known areas, or because of incomplete oiling information that raised questions about actual conditions in 1993. This was consistent with previous surveys, especially beginning with the 1991 May Shoreline Assessment Project (or MAYSAP).

The primary goal was to accurately locate and describe 1993 oiling conditions using the definitions and data recording methods previously employed. A secondary goal was to complete any simple, manual remediation that might speed up degradation of stranded oil, or otherwise improve the condition of a shoreline.

3.0 Operations

Field operations began June 4, 1993, and ended September 27, 1993. The field work was divided into seven phases that corresponded roughly to the times of the month when the tides were at their extremes. This procedure dated back to the early days of the response. The goal was to make sure that crews surveyed a given set of shorelines when the tide retreated far enough to expose the lowest stretches of the intertidal zone.

This was important because many of the shorelines were originally oiled during a period of very high and very low tides in April 1989. Generally, through 1992 at least, response crew supervisors tried to schedule as much work as possible when the tidal stage was no more than seven feet above mean low water. This was critical when there was a considerable amount of oiled area in the middle and lower intertidal zones.

This was somewhat less important in 1993, as oiling had decreased or disappeared in many low and middle intertidal areas. However, we stuck to the lowest tide periods for the sake of consistency, occasionally making an exception when past oiling data suggested that most of the remaining oil was in the upper- or supraintertidal. But for the most part, the survey phases were defined by those 7-8 day stretches when there were minus tides, or low tides that were a foot or two above mean low. This gave us a potential 14-16 field days per month, under ideal conditions.

3.1 Logistics and scheduling

The sites in the work plan were scattered throughout the western Sound from Perry and Lone Islands in the north to Latouche, Elrington, and Evans Islands in the south. We used a single crew and vessel and worked two low tides per day when weather and daylight permitted. Generally, there were 3-4 days at the beginning of each cycle when we could work two tides.

The weather was extremely cooperative from June through early August. We did not lose a single day to weather during that stretch, a fact that was as amazing as it was advantageous. Cruises were usually scheduled over a full 7-8 days of the available tide window, but we were able to complete each session's tasks 1-2 days early until the weather began to turn in mid-August (as it tends to do in the Sound).

We worked primarily from the M/V Pacific Star, a 65' LOA, Coast Guard inspected vessel. The vessel slept 10 comfortably but could accommodate more, if necessary.

The vessel had enough fuel capacity and speed to transit extensive stretches of the Sound either overnight, or between tides, so that we were not greatly restricted in our scheduling by distance or time. From Whittier, we could make Herring Bay and the northern Knight Island Archipelago in about 4-5 hours; the Gulf of Alaska crossing from Seward to Chenega Bay, Sawmill Bay, Evans Island, took 4-5 hours; most everything in between on the western side of the Sound was within four hours' running time.

Generally, we were able to schedule our site visits so that we could always complete two sites per day, and sometimes three when they were especially close together or not too complex in their oiling conditions.

We used helicopters for four clusters of site visits, flying out of Homer for outer Kenai Peninsula sites, Valdez for two days of community surveys, and out of Anchorage for the rest. We used the helicopters primarily when we had to finish several sites in a short time, and the vessel could not move us around quickly enough. We used Anchorage-based float planes to shuttle crew members in and out when unrelated tasks within their own agency required them to come out after the beginning of the cruise, or come in early. Usually we had one shuttle flight per cruise to change out several crew members.

If the Trustee Council decides to do further assessments of this type, I recommend building the schedule and logistical structure somewhat differently.

- **I would schedule the project for May 15 to July 15.**

  This is usually the most dependable period for good weather in the Sound. It also is the "lightest" time of year, with the longest available daytime windows. This makes it most possible to work two tides in reasonable lighting conditions.

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• **I would use a smaller crew — no more than 4-5 people at the most.**

For policy reasons we had a larger crew — sometimes as many as 10 people. However, the size of the areas we are surveying and the limited number of tasks involved make it difficult to keep that many people busy during the entire 3-5 hours in each field shift. Four trained people is just about right: two to observe and record data and two to dig and fill pits, and conduct other general ground survey observations.

• **Regardless of crew size, I would stage from a Prince William Sound location or port.**

We began using Whittier as the staging port later in the summer. It was a shorter drive from Anchorage to Portage (rather than Anchorage to Seward), and leaving from Whittier cut out the 4-5 hour Gulf crossing from Seward. Leaving from Seward usually meant that each cruise included 1-2 extra days of travel and crew downtime.

• **I would use a helicopter instead of a vessel (if using the smaller crew), and I would return the crew to a port in the Sound each evening.**

A helicopter would allow this smaller crew to work more sites, spaced further apart, on each tide, which would help scheduling of the project overall. Under this scenario, one could schedule a more intense, although shorter field season to fit within the optimal 60 days from mid-May to mid-July.

I also think it would increase overall productivity and reduce crew fatigue, and provide managers with some flexibility to change crew members in or out at relatively low cost, and to deal with extended stretches of bad weather. If you knew you were going to be in the middle of a week of marginal weather, you could just send people home to their regular jobs rather than leave them in the field, unable to work. This would also mean that you wouldn't be paying transportation or charter costs on days you weren't able to fly.

- **I would be more flexible in scheduling at the outer edges of the extreme tide periods, and I would schedule at least some of the work at some of the sites during higher tides.**

  At a number of the sites, the remaining, documented oiling is relatively high up the beach. If there is not real statistical or quality-control reason to make every visit at the lowest tide, I would schedule work during periods that would have been considered marginal in 1989-92. This, again, would allow you to schedule a more intense, but shorter field season and make for a more cost-effective operation.

3.2 Crew composition

The Trustee Council intended the 1993 shoreline assessment to build on data from previous surveys, and instructed the lead agency, DEC, to follow as closely as possible the methods and procedures used for assessments during the response.

The survey team was the same type of multijurisdictional cooperative that operated during the spill response itself. It included a mix of trustee agency representatives, major private landowners, the U.S. Coast Guard, and Exxon. In theory, everyone was to come along on every survey; as a practical matter, some agencies chose to participate on a spot basis, or not at all. In most cases, the crew included at a minimum 3-4 DEC environmental specialists, one land manager from the Department of Natural Resources, an area ranger from the U.S. Forest Service, a pollution control specialist from the U.S. Coast Guard, an Exxon employee or contract specialist, and a marine biologist under contract to Exxon. Most, if not all the crew members had one or more seasons' experience on the Exxon Valdez response.

NOAA contributed technical staff on two of the cruises, and the Chenega Corporation sent a representative on most occasions when the survey sites were adjacent to corporation uplands, or in the general vicinity of the village. Dr. James C. Gibeaut, under contract to the Trustee Council, was the project technical advisor on geomorphology and accompanied the crew on two of the cruises. DEC staff led the crews on the shorelines, scheduled the work, recorded the data, and coordinated comment from other field representatives.

3.3 Objectives

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The primary objective of the 1993 assessment was to observe and document residual oiling on selected shorelines in Prince William Sound and the Gulf of Alaska, using the same definitions, techniques and methods used during response-era assessments. The second principal objective was to compare 1993 information to that of previous years and provide at least a general qualitative analysis of how conditions are changing over time. A third objective was to provide advice and information to the Trustee Council about site-specific remediation as a possible restoration option.

While the methods, definitions, and procedures mirrored those of the response-era surveys, there were several differences worth noting. First, the response surveys included more and different types of qualitative observation. During the surveys from 1989-1992, Exxon contract biologists listed types of plants and animals observed in the intertidal areas and made general speculations about the relative health or abundance of the things they saw; crew members were asked to report sightings of large animals such as otters, seals, and eagles; field representatives of all disciplines were given wide latitude to comment on biological recovery, the apparent chemical composition of the oiling, the effectiveness of previous treatment, the need for future treatment, and so on. Technical staff also assessed the likely logistical demands of remediation efforts. The goal of all this, of course, was to figure out whether a site ought to be treated, and if so, how it should be done, how extensively it should be done, and what side-effects of treatment could be anticipated or avoided.

It was not necessary for the 1993 assessment to be quite so inclusive. Remediation was not a primary goal, which meant that certain types of qualitative observations no longer triggered or excluded certain actions on a shoreline. General qualitative biological observations were likely to be weaker, scientifically, and less specific than more quantitative and targeted efforts undertaken under other restoration projects. (We certainly made note of natural conditions that seemed relevant to each of us, based on what we had seen on shorelines over several summers, but these were not a primary focus.) In short, we looked at what the response surveys did best and concentrated on building on the best aspects of the previous surveys. The instructions from the Trustee Council and the work plan it approved assumed a qualitative approach and analysis, so we tried to produce the most defensible qualitative information. We decided, therefore, to determine as completely as possible the absence or presence of residual oiling, the extent of residual oiling (in spatial terms), the visual characteristics of the oiling, and the concentration of residual oiling.

The work plan was written broadly, since we did not know beforehand exactly what the conditions would be and how they could best be documented. We made several adjustments to our program based on what we were finding in the field at the outset.

For example, we decided to depend on still photographs and slides for documenting specific oiling conditions rather than videotape. The kinds of oiling conditions we saw in previous years were better suited to the "big screen" of video; extensive oiling was better portrayed by sweeping video shots. Much of the 1993 oiling was very localized and hard to shoot with a video camera; thin subsurface oiling lenses were hard to distinguish on video, particularly since the lighting in a hole in the ground is usually pretty poor. Also, as a practical matter, it is easier for the average person to take good still photos as opposed to good video.

We also did not sample widely for total petroleum hydrocarbon in sediments or for oil chemistry. Other agencies, especially NOAA, sampled on a more targeted basis under other restoration projects and I did not think it necessary for us to duplicate this type of data.

3.4 Site selection

At the end of the 1992 response season, DEC staff went over the field data from that year and listed approximately 50 shoreline sites that might be included on future assessments, if any. This was standard practice during the response; the intent was to flag potential trouble spots that ought to be either monitored or treated the following season.

It is important to note that this methodology was developed with remediation as the driving force. None of the response surveys, with the possible exception of the 1989-90 fall/winter state-sponsored assessment, were intended as a compilation or documentation of *all* oiled shoreline. The survey list for each subsequent year was made up of those shorelines on which:

a) remediation was possible or likely,

b) there was a question about the accuracy or completeness of last-recorded data, or

c) there was some special agency or public concern.

Therefore, the absence of a given shoreline segment from a subsequent survey list did not necessarily mean there was no longer any oil there, it meant, rather, that treatment was not likely for some reason. The reasons ranged from accessibility of the oiling, weather or logistical concerns, environmental or archeological sensitivities, or even a relative judgment about whether the residual oiling was "bad enough" to warrant treatment. While this worked for purposes of planning response activities, the methodology for selecting survey sites was not likely to produce an accurate picture of specific oiling conditions throughout the spill area.

At the start of this project, we had two general options for selecting sites. If documenting *all* the residual oiling from the Exxon Valdez spill was the goal, we would have had to go back to original oiling reports, then sift through subsequent survey development records to determine which sites "dropped off" because there was little or no oil, and which were deleted because of access or

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other complication not directly related to actual oiling conditions. This is certainly possible, but the budget and time frame allotted for the project made this impractical.

Therefore, we decided to work from the DEC 1992 post-assessment list, with the goal of documenting and describing the oiling conditions at sites that had the longest and most extensive history of being "hot spots" during the response. For the purposes of practical information, preliminary policy-making, and limited extrapolation, this was a useful, achievable and cost-effective goal. The methodology was not likely to produce that accurate picture of all remaining oiling, but it could give the public and policy-makers a good sense of how things were changing and what one could expect to see — or not see, for that matter — on a visit to Prince William Sound.

As in previous years, sites were included on the 1993 survey list for reasons of public policy and public responsiveness. The Trustee Council, by resolution, instructed the assessment team to attempt to make an additional 70 sites visits requested for survey by the community of Chenega Bay, putting the final survey list at 122 for 1993, actually an increase over the previous year.

3.5 Field work

We used as a guide oiling data going back to initial field observations made by state, federal, and/or Exxon survey teams in the spring of 1989, and subsequent survey data at those sites. We found the most useful information to be the detailed field sketch maps made by Exxon geomorphologists who accompanied each survey team over time. These "OG maps" were, in most cases, excellent guides to locating most residual oiling at most of the sites. (Note to acronym collectors: The "OG map" relates to the title of the people making the sketches — the **Oil Geomorphologists.**) We attempted to update each of these maps, marking both 1993 oiling conditions and any significant changes in beach profile, general physical setting, or other notable aspects of the area.

We also depended on the personal knowledge of individual crew members, several of whom had been at many of the sites — sometimes many times — over the four previous summers. All the DEC and Coast Guard staff had served throughout the spill area since 1989 and 1990, the chief Forest Service ranger assigned to the project was a member of the first interagency resource assessment teams in 1989, and DNR's representatives were either area park rangers or a resource specialist who had worked the spill response.

Therefore, at most of the sites, we allowed experience, the physical setting of the site, and significant obstacles to determine the boundaries of the 1993 assessment. This was a change from previous years, when surveys were strictly limited to the discrete work sites from the season before. This was partly a function of procedural policy, partly because of the number of sites on most surveys (the 1991 survey included nearly 600 sites), and partly because the response assessments had to take place within a short period in the spring so that the summer could be devoted to actual treatment. We did not have these kinds of pressures driving the 1993 project, and could therefore take more time to explore the sites and map them more precisely. However, most of the time we limited our ground surveys to specific areas mapped in 1992 and allowed the so-called "OG maps" of 1991 and 1992 as our primary guides.

3.3.1 General ground surveys

We actually completed 48 of the 52 general ground survey sites on the original work plan list. Two of the sites (BP004A and SE042) were dropped for logistical and technical reasons, and two study sites in the Gulf of Alaska were not logged on the data sheets because the adjacent landowner opted to do less detailed inspections. The project's technical advisor approved these field changes and did not think they would affect the data analysis.

Sites were identified by the segment, subdivision, and work site designations developed during the response. In 1989, Exxon and DEC cartographers and analyst-programmers used satellite photographs. NOAA marine charts, and USGS topographical maps to create an "electronic shoreline," which was then broken into segments defined primarily by major topographical or geographical features. The segments were identified by two letters corresponding to the island or area's name, and three or more digits corresponding to areas between the headlands, bay, bight, etc. used as border markers on the electronic shoreline.

As surveys and cleanups became more targeted, smaller areas within shoreline segments were identified by letters and numbers of subdivisions and work sites. For almost all of the 1993 general ground surveys, we were working primary at the "segment-subdivision" level of precision to start off. All of the segments, by this time, were made up of extended areas of little or no oiling, so survey by *segment* set too large a target; survey by *work site* set a target far too small to get a reasonable picture of the conditions.

Using the "OG maps" and other previous oiling data as a guide, the crew came ashore and would begin digging pits in the general vicinity of the last reported oiling. The pits varied in depth from roughly 10 to 50 centimeters, depending on previous oiling information and the physical characteristics of the substrate. Usually one first had to peel back a layer of larger, armor material such as rounded boulders and cobble before digging into the smaller sand and pebble and gravel layers could begin. We tried to space the pits no greater than 10-12 feet apart, parallel to the water line. In cases where we had found oil in several zones (upper, middle and lower intertidal areas) moving upslope, we tried to keep the upslope pits roughly in line with those immediately downslope.

It was not a true grid system, but it established a ground survey plan with four variables: surface oiling, subsurface oiling, area parallel, and area up and downslope. We dug the test pits both inside and outside the last reported areas of oiling. The number of pits varied widely, depending on previous data and what we were finding. In some cases, we dug as few as six pits; in a few others, we dug as many as 60. For surface oiling, crew members fanned out and made visual observations, usually covering the entire subdivision or topographical unit.

The goal was to delineate as precisely as practical the area encompassed by the oiling. We defined areas on the maps by areas that appeared to be continuous under the surface; surface areas were often more broken and sporadic and were described as a percentage of the total area surveyed, or a percentage of the total area of the intertidal zone where the oiling was found. This was consistent with the methods and descriptions of previous surveys.

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3.3.2 Additional transects

The project's consulting geologist expanded the work plan to include 15 sites at which NOAA and/or DEC had previously laid out transects. These sites were selected primarily for the consistency and quality of the data over time, and were intended to add some level of quantitative analysis to the project. We completed 11 of these additional surveys.

At these sites, crew members dug pits and recorded surface and subsurface data along the transect only. (In some cases, the pits were dug two meters to the left or right of the transect line because we thought repeated pit-digging along a certain transect over the years could have actually been the same thing as treatment, and the data would not really reflect natural changes in oiling over the period.) The data from the transect sites were more tightly tied to geomorphology of the site. In addition to oiling descriptions, crew members measured the beach profile and recorded the sediment types both on the surface and in the distinct strata shown in the pits.

3.3.3 Community surveys

On May 17, 1993, leaders from the community of Chenega Bay submitted a list of 82 sites the community members wanted to be included in the shoreline assessment. (See attachment.)

The Trustee Council included these sites in the 1993 shoreline assessment. This presented some technical and logistical issues.

Although 12 of the Chenega sites were already on the work plan list, the rest were not. Most of the sites had been surveyed by response teams and been recommended for no further treatment or assessment, some as far back as 1990. Therefore, according to the methodology for site selection, they had been deleted from subsequent assessments. Since we used essentially the same methodology in 1993, these sites were not on the work plan list for full ground survey. They were, in fact, unlikely places to find residual oiling, which conflicted with the principal goal of the 1993 assessment, which was to locate and describe residual oiling. We had to find a reasonable way to be responsive to public concerns without compromising the technical validity of the project. In addition, we had to find a reasonable way to visit more than twice as many sites as planned while staying within the original budget.

With Restoration Team concurrence, we decided to stick to the original schedule and survey the 52 sites, plus the additional transects, using the full crew and the vessel. This would allow us to assess the dozen, most heavily oiled Chenega sites as a priority. We would then visit as many secondary Chenega sites as possible, using a helicopter and a smaller crew of DEC staff and a Chenega Bay representative. Since these sites were primarily adjacent to Chenega Corporation uplands, the Restoration Team did not require additional trustee agency participation.

On July 6-7, we conducted aerial and ground surveys along the entire coast of Chenega Island. This encompassed about 20 segments and subdivisions, but we actually landed and walked the shorelines of 10 segments at the northern and southern tips of the island, which were the two areas with the heaviest initial impact in 1989. We also visited a site as Eshamy Bay on the mainland at the request of Gail Evanoff of Chenega Bay. During our July and August vessel-based survey cruises, we completed full ground surveys at the highest priority sites in and around the village, Elrington, Latouche, and Bettles Islands.

The third tier priority cluster of sites, Shelter Bay on Evans Island, were not surveyed during this project due to weather.

On July 2-3, I visited sites at Windy Bay, Chugach Bay, Gore Point, Nuka Passage, Yalik Glacier and Port Dick on the Kenai Peninsula mainland with Pat Norman of Port Graham and two Kachemak Bay State Park rangers. Like the community surveys with Chenega Bay representatives, this helicopter-based assessment was intended as a quick check-up of former "trouble spots," rather than a full-scale assessment. (One Kenai site, TB004A at Tonsina Bay, received a full ground survey in late September, because during the first visit in July the tide was not low enough to allow us to find the oiling.)

4.0 Policy and management evaluation

Of the 48 ground survey sites and the 11 transect sites, all showed surface and/or subsurface oiling. Judging from treatment histories, previous surveys, and the 1993 assessment, the oiling is sporadic along these coasts, but it present at sites throughout western Prince William Sound.

The surface oiling consisted primarily of asphalt pavement, tar splatters, tar trapped in shales, and the chocolate-brown emulsion generally known as mousse.

On cobble beaches where asphalts were found, they generally appeared as sporadic clusters bound up with rocks and sand. These patches ranged from rock-hard and dry to some with a hard surface "scab" covering a fudge-like brown, weathered oil. We broke up these patches whenever we could during the course of the survey. Some sites, especially those with heavy initial oiling in boulder fields, showed bands of hardened tar and weathering mousse. With a few exceptions, the larger clusters of patches and bands of asphalts occurred in the upper intertidal areas, or in areas that were sheltered in some way from wave energy.

Boulder fields in areas with heavy initial impacts occasionally proved to be still heavily contaminated with asphalt and mousse. The oiling at these sites consisted primarily of large, thick patches of asphalt trapped between boulders, and mousse about the consistency of chocolate syrup. The mousse at a few sites was visible from the surface, but at many of these sites it was trapped beneath boulders and exposed only when the rocks were turned over.

The clues to subsurface oiling were not generally visible. Many of the sites with subsurface oiling had little or no visible contamination. Several sites gave off sheens at the tide came in, or as surface runoff trickled through the oiled zone. Very few sites appeared to sheen on their own. (Some sites sheened lightly after we had dug pits or turned over rocks.)

All the sites we visited had oiling data from 1989 through 1992. The original oiling conditions in April and May after the Exxon Valdez can be compared to successive site visits in 1990, 1991 and 1992, and the progressive changes can be tracked fairly easily. For this reason, I am confident that with a few possible exceptions, all the oiling observed can be tied to the Exxon Valdez oil spill.

The exceptions could be occasional patches of surface asphalt or tar splatter, which this survey and others (Kvenfolden, 1993) suggest can be very resilient over long periods of time once the oil has been reduced by weathering to its paraffin and asphaltine fractions. However, it is highly unlikely that the large areas of surface and subsurface oiling we documented could have come from some other source.

First, as stated above, the impact of fresh oil coming ashore in 1989 has been documented at these sites, and progressive changes can be tracked over time.

In addition, there have been no other reports of large crude or heavy fuel spills in this area. While one cannot automatically exclude this as a possibility, had such large spills occurred, they would have had to come from large-volume carriers such as tankers or commercial fuel delivery barges. Spills from these type of carriers probably would have been reported at the time, or discovered when the spiller made port and had to account for fuel loss or use, or cargo lost. The only crude carriers in the area are the major carriers out of the Valdez terminal.

Further, the types of fuel that would leave a heavy asphaltine fraction are not generally used by the types of vessels that have transited the area in the 1980s. Diesel and gasoline, the primary fuels for recreational and small commercial fishing vessels, do not contain heavy asphaltine fractions; when these fuels do contaminate soils, they leave a different, less persistent kind of residue than a crude or heavy bunker fuel.

For these reasons, we suggest that for the purpose of analysis, a reasonable person would conclude that the residual oiling we describe is a result of the Exxon Valdez oil spill.

For purposes of description, we have separated the survey area into six general groups:

- The Northern Islands (Perry, Lone, Applegate, Culross)
- The Outer Islands (Smith, Green, Seal)
- Knight Island North (Eleanor, Disk, and Ingot Islands, Herring Bay)
- Knight Island Outer (The exposed eastern shore of Knight)
- Bay of Isles
- The Chenega Area (Evans, Bettles, Elrington, Latouche Islands)

We grouped the areas this way based on primary uses in the area, topography, oiling impacts and treatment histories, and proximity to settlements.

4.1 The Northern Islands

We assessed six sites in this area: two on Lone Island, two on Applegate, and one on Perry. This is a relatively busy, multi-use area of the Sound that receives most of its traffic from the port of Whittier. The area is easily reached by small recreational or commercial vessel from Whittier, and the islands are within the ferry and commercial marine corridor to Esther Island hatchery and Valdez. There is a long, documented history of recreational and commercial tourism use at Applegate and Perry Islands. Until last year, there was a small trespass sauna at Applegate; there is trash and other evidence that several sites have been frequently and recently used as camp sites on the island. Perry Island is part of a well-known kayak tour route, and we noted several trails leading either into the uplands or across island to other beaches. There is also a commercial oyster farm now in the twin bays that cut deeply into the island.

This area had some of the heaviest initial impacts from the Exxon Valdez spill, and was the scene of some of the earliest shoreline cleanup efforts.

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We found two small areas of subsurface and surface oiling at the Lone Island sites. One was in a boulder field, the other in a small pocket cove with substantial bedrock outcrops that break wave energy. The Applegate Island sites were largely free of oil, with the exception of a few areas of very hard and persistent tar and asphalt packed between leaves of thin shale that has been tilted vertically and exposed along the shorelines.

There is also obvious evidence of scientific study at the Applegate coves, in the form of barely exposed rebar and leftover flagging that presumably defined study sites or marked transects. Some of the rebar is in the middle and lower intertidal and could present a hazard to kayaks, inflatables, of skiffs coming ashore at these well-used recreational anchorages.

The Perry Island (PR16) site is one with a long treatment history. It was heavily oiled in 1989 and heavily worked in 1989, 1990, and 1991 with large-scale washing and mechanical tilling operations at various points in time. It is a steep, high-energy, rounded boulder and cobble beach. However, two large bedrock outcrops in the center of the site break some wave energy. Behind this outcrop, and in a boulder field to the west, there are two areas of subsurface oiling beginning about 15 cm below the surface. This oiling is not visible at the surface and was characterized in 1993 as medium oil residue. It does not appear to have an impact on recreational uses, and, due to the porous nature of the site, is a good candidate for continued improvement on its own.

4.2 The Outer Islands

We visited four sites in this area, two from the ground survey list and two on the transect site list. A fifth site that we originally planned to visit was deleted for weather reasons.

The two work plan ground survey sites were both on Green Island, an island of low hills and shallow, sheltered bays and coves. For an island that is relatively exposed, it has fairly high biological values (Juday, 1990), probably due to the various sheltering areas of bedrock both on the shoreline and just off the southwestern shore. Several areas were heavily oiled in 1989 and received treatment through 1991, although work had to scheduled around shorebird nesting and rearing times and other biological sensitivities. We found areas of surface and near-surface oiling at both sites we visited, and in each case the oil was either extremely weathered or primarily characterized as light oil residue.

It is also worth noting that while one crew was walking from one site to meet up with a second group at the other site, we encountered extended areas of tar and chunks of asphalt pavement at sites not on the 1993 survey list. These other sites, at the north end of the island, were last visited in 1991 for the most part. After the 1991 season, they were deleted from future surveys because it was judged that no further treatment was possible. Indeed, treatment here would have been extraordinarily difficult and probably not very effective, but the oiling is still present. Like Applegate, this area has extended areas of exposed shale bedrock that has been tilted vertically and was filled when oil came ashore and soaked the rocks. The oil is thick and weathered and tightly packed in the leaves of shale; in some areas, there were sheens on the tide pools. In a more sheltered cove to the east of this area, there were thick chunks of asphalt mixed with gravel, some of them somewhat less than a meter across and 5-8 centimeters thick.

We worked one transect at SM008, at the southeastern end of Smith Island. This is a high-energy beach made up of very large, rounded boulders and cobbles that are tightly wedged together, and occasionally mixed with sand and pebbles below the upper layers of armor. This transect had oil from the lower intertidal (just above the Fucus line) all the way to a platform just below the storm berm.

We visited one site at Seal Island, SE041A, a complex site consisting of a large tide pool, an extended tombolo, tall bedrock outcrops and a sheltered platform covered with disk-shaped boulders and rocks. It has a thin gravel substrate underlain with a thick organic layer very close to the surface. There are seabird nesting sites (we observed two pairs of oyster catchers) and more than a dozen harbor seals bobbing just offshore the tombolo.

This area was soaked heavily by oil in 1989. In 1991 it was still heavily oiled and received about three days of work. The armor was removed from an area of the platform and crews used a cold sea water flush, manual agitation of sediments by rakes, and sorbent material to release and contain the oil. A smaller, similar manual operation (minus the flush) was used in 1992 on a smaller area. In 1993, along the DEC transect and in the areas adjacent to it, the thin sediments above the organic barrier layer were still substantially oiled and sheened readily when disturbed, so we dug as few pits as possible and did not stray far from the transect line. This site should be monitored further. Because of an approaching storm and the fact we were some distance from safe anchorage, we did not conduct a scheduled ground survey at SE042.

4.3 Knight Island North

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This area includes the smaller islands of the Knight Island Group, along with Herring Bay and a small portion of the mainland to the west at Main Bay. This was an area that was heavily oiled by the initial impacts of the spill as well as what DEC termed secondary oiling, which occurred during the on-the-water recovery period in April and May 1989. Because of local currents, tides, and circulation patterns, the oil that arrived from the vessel tended to stay around this area, moving continuously in a clockwise pattern (Hull, 1989). Oil came around the island group and entered the west-facing bays, such as Herring Bay, Knight Island and Northwest Bay, Eleanor Island, and remained trapped. There was quite a bit of "saturation" oiling, as large slugs of crude and mousse came ashore and soaked area shorelines.

This area also received considerable cleanup effort early on, especially in Herring and Northwest Bays, which were protected from weather and thus provided more stable working conditions.

We visited 13 sites during ground surveys in this area, and worked an additional four transects. This area, especially within Herring Bay and at Herring Point, is one of the two areas where one could find groups of contaminated sites fairly close together.

For the amount of oil documented within Herring Bay in 1989, the overall current picture of the area seems remarkable. There are several localized areas of significant surface and subsurface oiling that should be noted, however. Near the back of Herring Bay, on an east-facing subdivision with a major

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anadromous stream, is KN132B. The area immediately around the stream is relatively oil-free, but moving north, there are three noticeable bands of heavily weathered, very hard asphalt mixed with angular cobbles and gravels. In the biggest band, which measures roughly 145 meters long by four meters wide, the asphalt is rock-hard and difficult to break up. It does not sheen when pieces are placed in the water, which suggests a very advanced state of weathering. There are also some remnants of a Fish and Game camp site in the adjacent uplands, including a wooden tent platform and other small shells of structures.

A cluster of pocket beaches near Herring Point makes up KN300. At each of these sites, we found areas (the largest about 100 meters square) of high oil residue buried a few centimeters below the surface. Several of the pits showing HOR were in the extreme lower intertidal, including some below the Fucus line. While this oil sheened readily, it was not immediately obvious from the surface. When peeling back the cobble armor to dig the pits, we noticed amphopods, tiny eels, limpets and other small plants and animals in the active zone above the oiled sites.

Just outside of Herring Point, at KN500A and KN500B, the crew had little difficulty finding oil in pits within the previously documented oiled zone, but most of these pits showed medium or even light oil residue. These sites were the subject of intense work in 1989 and 1990, with some additional work in 1991.

On the other, west-facing side of the bay, the crew made three site visits, one for a ground survey and two others to run transects. Both transect sites had little or no visible surface oil, and very light or no subsurface oil on the transect. A third site in between the transect shorelines was largely free of oil, but the crew did locate a thin band of subsurface oiling buried very deep (40-50 centimeters) under the cobble beach in the mid-intertidal zone.

In general, there was little visible surface oiling in the areas we surveyed, although the crew did not walk the long, steep, boulder-field foot of the bay's western shore.

We visited five sites at Eleanor Island, two within the sheltered, northwest-facing bays and the rest on the high energy shorelines on the east. Of particular note is the site at EL056C, which even in 1993 had strong—smelling, black oil buried in an area of the middle and low intertidal zone. This area did not receive much treatment, at least not in the lower intertidal, because of access and environmental sensitivities; because it is so far down the intertidal zone, it is not exposed for long. This site should be monitored in the future. Also of note was the transect at EL107, which, while not on this year's ground survey list, still showed consistent subsurface oiling under the rounded cobble armor. This site is a steep, high-energy beach that presumably gets hit fairly hard by wave action fairly frequently.

The crew located oiled boulder fields at three, mid- to high-energy sites on Ingot Island.

There was one site visit at Disk Island, DI067, which contains a large mussel bed that was heavily oiled and is the subject of additional study by trustee agencies. There was some surface oiling around the site, and heavy and medium oil residue under the mussel bed in the middle intertidal.

The crew visited two small islets in Foul Bay, just off the mainland. (These are part of a Main Bay segment, MA002.) Generally, the area looked oil-free on the surface. It was interesting to note the abundance of Fucus and other seaweeds at one of the sites, which had been cleaned aggressively with hot water in 1989. Also of note was a small tide pool at MA002A, in which workers in 1992 had cleared out rocks and agitated heavily-oiled sediments. The area still shows signs of obvious oiling — the tide pool sheens spontaneously from its outlet — but there is extensive and diverse plant and animal life within the zone.

4.4 Knight Island Outer

This area includes all the shorelines on the eastern shore of Knight Island, with the exception of the Bay of Isles. Four of the five sites we visited in this area are relatively exposed, and did not receive much treatment until the latter part of the 1989 cleanup season.

Due to the amount of oil that came ashore and the limited treatment (mostly manual after 1989) in subsequent years, it is not difficult to find mousse and other heavy oil residue in these boulder beaches. There are visual clues, and more oiling can be located by turning over rocks and small boulders. They have improved in their condition since 1991 and presumably weather and wave energy will continue dispersing or breaking up the oiling. However, these sites (KN211, KN209, KN213) continue to contain areas of heavy oil residue. At Point Helen, KN405A, the crew found some traces of surface oiling and various low levels of subsurface oiling along the whole subdivision. This area was very heavily oiled in 1989 and was treated aggressively through 1991. It was a particularly complex area to treat due to the fact that it was so heavily oiled, so exposed, and subject to a complicated energy pattern (Hays and Michel 1990). Oiling here in 1993, however, appeared significantly lighter than during pre-treatment surveys in 1991.

4.5 Bay of Isles

The Bay of Isles is a visually stunning area, the entrance through a narrow, mountain-edged mouth, the mountains of Knight Island's spine rising at the back of the bay, islets scattered about the inside waters, and a variety of angular cobble beaches nestled at the foot of steep-sided, spruce covered slopes. Large slugs of oil surged through the entrance in 1989 and settled primarily on beaches in the south arm. Segments KN134, KN135, and KN136 received much of the attention of the response teams in this area through 1991.

The most publicized area was probably KN136, sometimes described as a marsh and sometimes as a lagoon. This segment actually consists of a rocky buttress and high intertidal platform that shelters a tide pool that is primarily a settling place for organic material. There is a thick layer of peat, or a similar woody compound in the basin. This peat bog is above low water and drains at low tide. It was heavily oiled and primarily left alone after experiments with treatment that included laying sheets of plywood so workers could walk into the peat without stirring up the muck or sinking oil more deeply into it by tromping through it. It still smells of oil, and the platform in the supratidal is still heavily contaminated, although quite a bit less so than in 1989 and 1990. The bog itself is still oily. We dig not conduct a ground survey in the bog, although we did run a transect near the back of it. There isn't much one can do about this area other than leave it alone. It is improving slowly, judging from previous data and crew member observations.

It is interesting to contrast this site with adjacent beaches, especially at KN134 and KN135, both of which received aggressive and continuing treatment throughout the response period. These sites seem to show considerable improvement; KN135 showed a few pits with light to medium oil residue, and a transect site in the area showed similar characteristics. While one could not tie this improvement to treatment efforts in a quantitative manner, it is worth noting that these areas are sheltered, low energy sites that are not likely to "clean themselves up." It is my opinion that the treatment here was well worth it, at least in terms of releasing and recovering oil. Judging from the angular nature of the cobble beaches, I have some question about whether weathering and wave energy alone (or primarily) effected the big changes we see here.

4.6 The Chenega Area

This is a tough area to assess, because the technical issues and the social and economic issues are closely intertwined.

Based on my conversations with village representatives this summer, it is obvious that they are not satisfied with the condition of several clusters of beaches, regardless of how they compare to conditions at sites in other areas of the Sound. We visited 16 individual sites in the area, not counting the aerial survey of Chenega Island and surveys at the southern end of Knight Island. This area contains some of the most persistent, heavy- and medium oil residue concentrations that we found on this assessment.

Some of the areas are small and localized, such as those at Bettles and northeast Evans Island, and some are more broadly and consistently oiled, especially the area within Sleepy Bay and the headlands on either side of this bay on Latouche Island. There are long bands of oiling in boulder fields and buried in the mid- to upper intertidal areas of Sleepy Bay's northwest shores. At least two of them are more than 100 meters long, and indeed, one can find residual oiling at the surface and in the subsurface throughout this northwestern area defined at LA20B and LA20C. The boulder fields at LA20B are scarred with areas of pavement, and the mid- to upper intertidal areas of LA20C have easily accessible areas of subsurface medium and high oil residue. Outside the bay itself, on the arms at LA21 to the northwest and LA15 to the northeast, oiling occurs sporadically — and occasionally significantly — throughout the segment. (Again, aggressive treatment may have combined with a favorable physical setting at some sites — notably LA15C and LA20A — to produce the best results over these past five seasons.)

These areas will probably continue to improve over time, as others in the western Sound have. However, this does not appear to be acceptable to the people of Chenega Bay, who hunt and fish and beachcomb in the area adjacent to their village on a day to day basis. They have expressed continuing interest in accelerating the improvement through treatment of some kind.

The most heavily oiled areas are significant when compared with others on the survey, and they are near the village. This exacerbates the social and economic effects of the oiling. Perhaps because villagers can locate oil so close to home, they often perceive that the oiling is broader or more extensive — hence the request to survey those 70 additional sites. In fact, our experience on the community surveys tended to support the information on file, which showed that these sites were largely free of oil. However, there are lingering doubts among certain village representatives and they hope that a remediation effort will reduce or eliminate problems both real and perceived.

4.7 Restoration and remediation

In a purely technical sense, beach cleaning at this point — especially by manual means — would likely produce only incremental results. A handful of sites lend themselves to manual work, and the amount of work is probably low relative to the time, money, and effort required to conduct it. (See attached.) Agency representatives from ADNR and the U.S. Forest Service expressed some interest in limited remediation at some sites, but this did not appear from their comments to be a high priority. In Chenega, however, remediation remains a priority.

There may be good policy reasons for pursuing remediation at sites, whether that be in the vicinity of Chenega Bay village or at recreational use sites at Applegate Island. Surface oiling, because it is stabilizing, may be a better target for remediation than subsurface oiling, which appears to be dispersing or breaking up more quickly. It is interesting to note that at some well-surveyed sites on our list, the decrease in subsurface oiling since 1991 is 94 percent. This is probably a high end figure, and not applicable to all kinds of sites, but it is certainly an indicator that subsurface oiling tends to disperse naturally better than surface oiling, especially where aggressive treatment gave the process a boost.

I suggest three practical options for remediation as a restoration strategy:

- *Clean up debris*

We frequently came across rebar, signs, back-stakes, flagging and other evidence of study work at shorelines throughout the area. It would be worthwhile to find out who has marking out there and whether they are still using it. If they're not, it ought to be pulled up.

- *Manual cleanup of selected, high priority sites*

I estimate that one crew, working 30 field days, could complete manual work at 10-12 sites around Chenega Bay if the Trustee Council felt this was an appropriate policy action.

- *Manual remediation of mussel beds that remain oiled.*

This is largely a biological assessment issue that this project did not address. NOAA is studying this problem under a separate restoration project, and there may turn out to be sound biological reasons for removing these sediments rather than waiting for them to disperse naturally. If that turns out to be the case, we have determined that manual remediation at some of the sites is technically feasible, as long as any releases of oil are properly contained and cleaned up.

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March 25, 1994

This is just for info--as we agreed, a "crib sheet" of what the editors have found in text to date.

Special note to authors: You will find questions on text and stickies throughout Chapter 3. For almost all of these, the eds. aren't looking for answers but instead are trying to help spiff up or smooth out the text by asking you to rethink or doublecheck the presentation of information.

Also, please (please, please!) return previously edited drafts. They obviate a lot of wheel reinvention. Thx.

ACRONYMS

ROD: See questions below. You will have to go thru and make the decisions about acronym identification.

Chapter 3

ADF&G	State of Alaska Department of Fish and Game	(p. 6?) (identify here?)
ANCSA	Alaska Native Claims Settlement Act	(p. 12)
AOU	American Ornithological Union	(p. 21)
AVSP	Alaska Visitors Statistics Program II	(p. 77)
EVOS	*Exxon Valdez* oil spill	(p. 1)
FRED Division	Div. of Fisheries Rehabilitation, Enhancement and Development (State, ADF&G)	(p. 86)
MMPA	Marine Mammal Protection Act of 1972	(p. 16)
NMFS	National Marine Fisheries Service	(p. 16?) (identify here?)
NPFMC	North Pacific Fishery Mgt. Council	(p. 30)
NPS	National Park Service	(p. 12?) (identify here?)
NWR	National Wildlife Refuge	(p. 12)
PNP	private nonprofit	(p. 84)
PWS	Prince William Sound	(p. 2?) (identify here?)
PWSAC	?	(p. 89)
PWSRPWG	?	(p. 70)
PWSRWG	?	(p. 76)
USFS	U.S. Forest Service	(p. 89)
USFWS	U.S. Fish and Wildlife Service	(p. 11?) (identify here?)
VHS	viral hemorrhagic septicemia	(p. 41)

ABBREVIATIONS

m	meter, meters	(p. 5)
yrs	years	(p. 11)

COMPOUNDING/UNIT MODIFIERS

cleanup crew (adj.), oil spill cleanup (n.), but clean up the mess (v.)
deep-water area (u.m.)
forest#land management
nonoiled
open-water area (u.m.)
prespill and postspill (both one word)

OTHER STYLE NOTES

Alaska Natives (not Alaskan Natives)
EVOS Trustee <u>Council</u> (not EVOS Trustees)
lower Cook Inlet (geography); outer Cook Inlet (sociocultural)
split infinitives--we try to keep verbs together (e.g., not "were still being" but "still were being")
symbols:

%--use symbol in parens or in tables and figures but the written-out word in all other text

dash--use "to" or "through" when possible (e.g., not "from Jan-Jun" but "from Jan to Jun" or "April and May," not "April-May")

brackets--use brackets within parens (e.g., Tom went to town [on April 1] to buy some jam.)

double dashes--(like the ones just preceding) are sometimes used in text to help set off matter, and particularly in sentences with a great deal of punctuation. There are no spaces between text and these dashes.

k:\users\eas\evoseis

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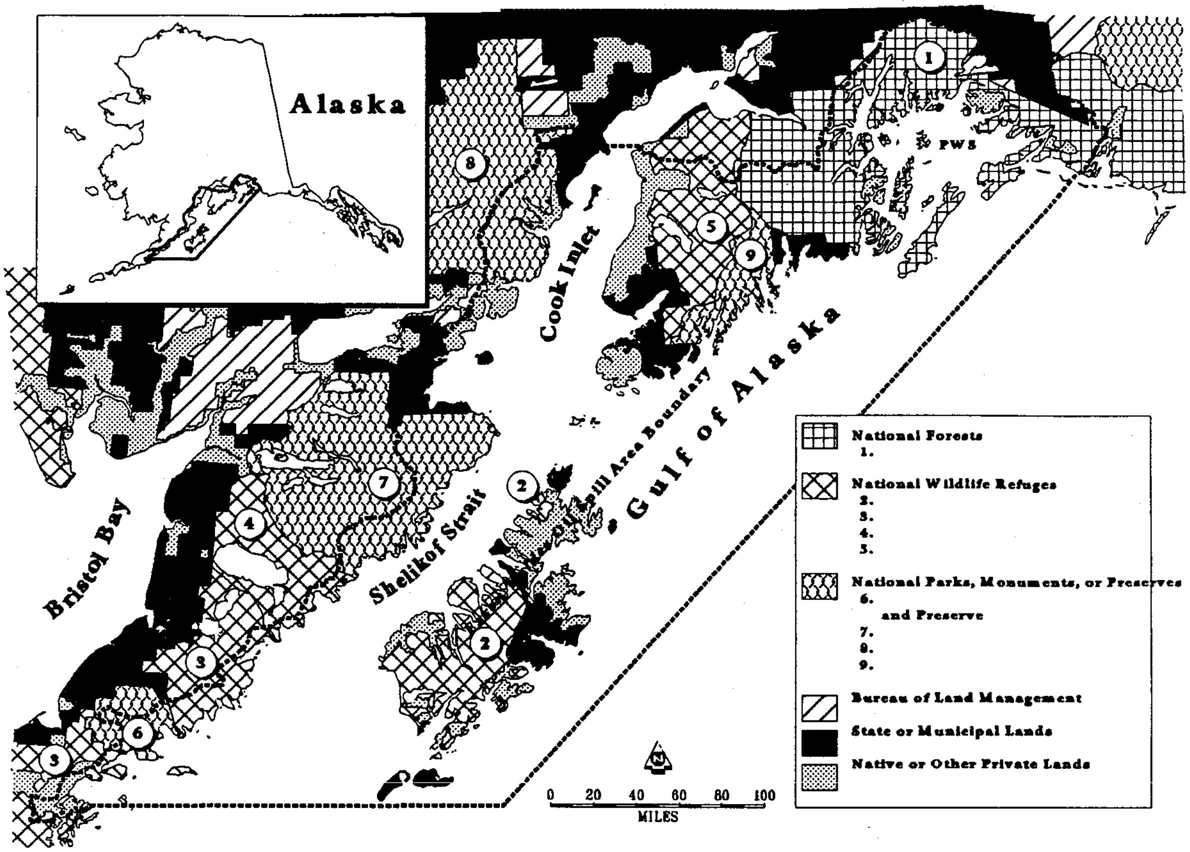

Alaska
Cook Inlet
PWS
Bristol Bay
Shelikof Strait
Gulf of Alaska
National Forests
1.
National Wildlife Refuges
2.
3.
4.
5.
National Parks, Monuments, or Preserves
6.
and Preserve
7.
8.
9.
Bureau of Land Management
State or Municipal Lands
Native or Other Private Lands
0 20 40 60 80 100
MILES

FIG 3-2

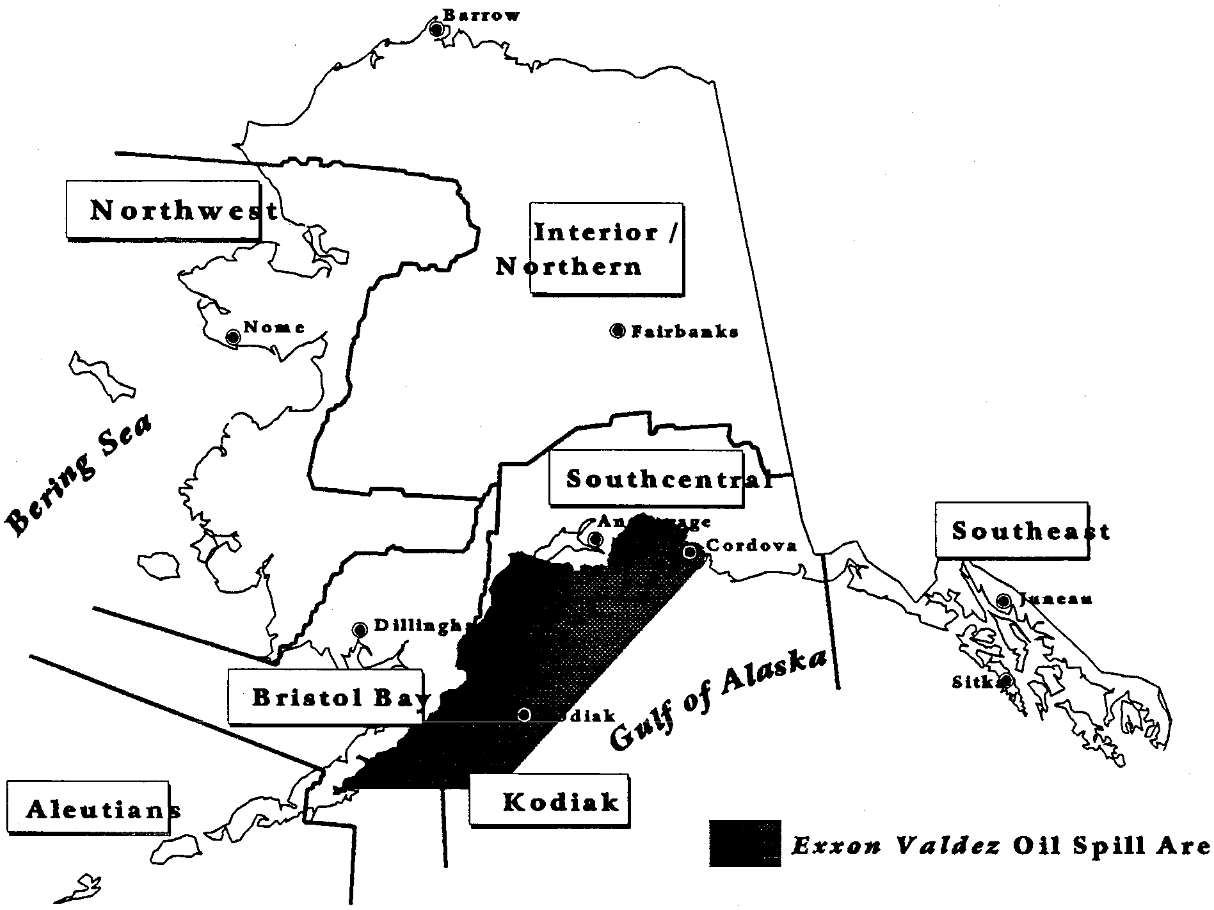
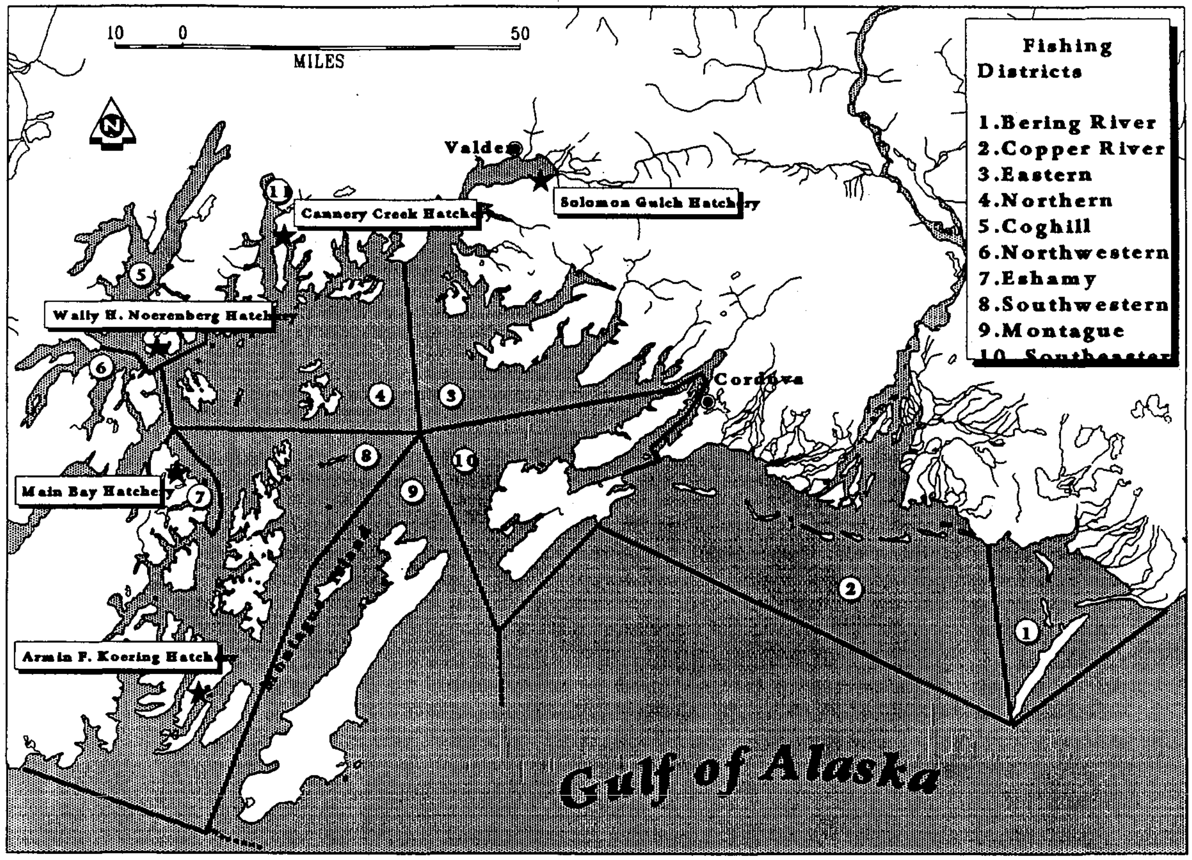

Barrow
Northwest
Interior / Northern
Nome
Fairbanks
Bering Sea
Southcentral
Anchorage
Cordova
Southeast
Juneau
Dillingham
Gulf of Alaska
Bristol Bay
Kodiak
Sitka
Aleutians
Kodiak
Exxon Valdez Oil Spill Area

FIG 3-1



10 0 50
MILES
Fishing Districts
1.Bering River
2.Copper River
3.Eastern
4.Northern
5.Coghill
6.Northwestern
7.Eshamy
8.Southwestern
9.Montague
Valdez
Cordova
Cannery Creek Hatchery
Solomon Gulch Hatchery
Wally H. Noerenberg Hatchery
Main Bay Hatchery
Armin F. Koering Hatchery
Gulf of Alaska

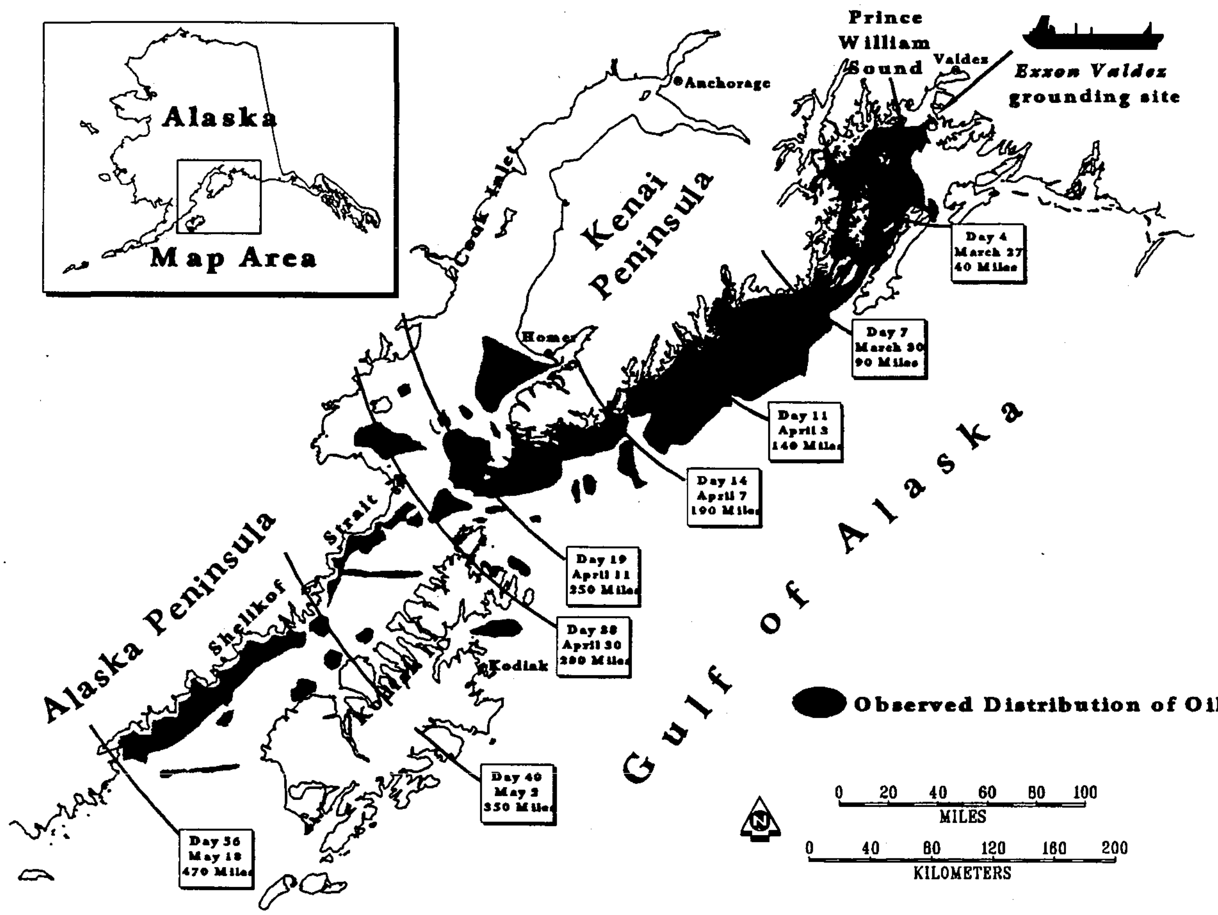
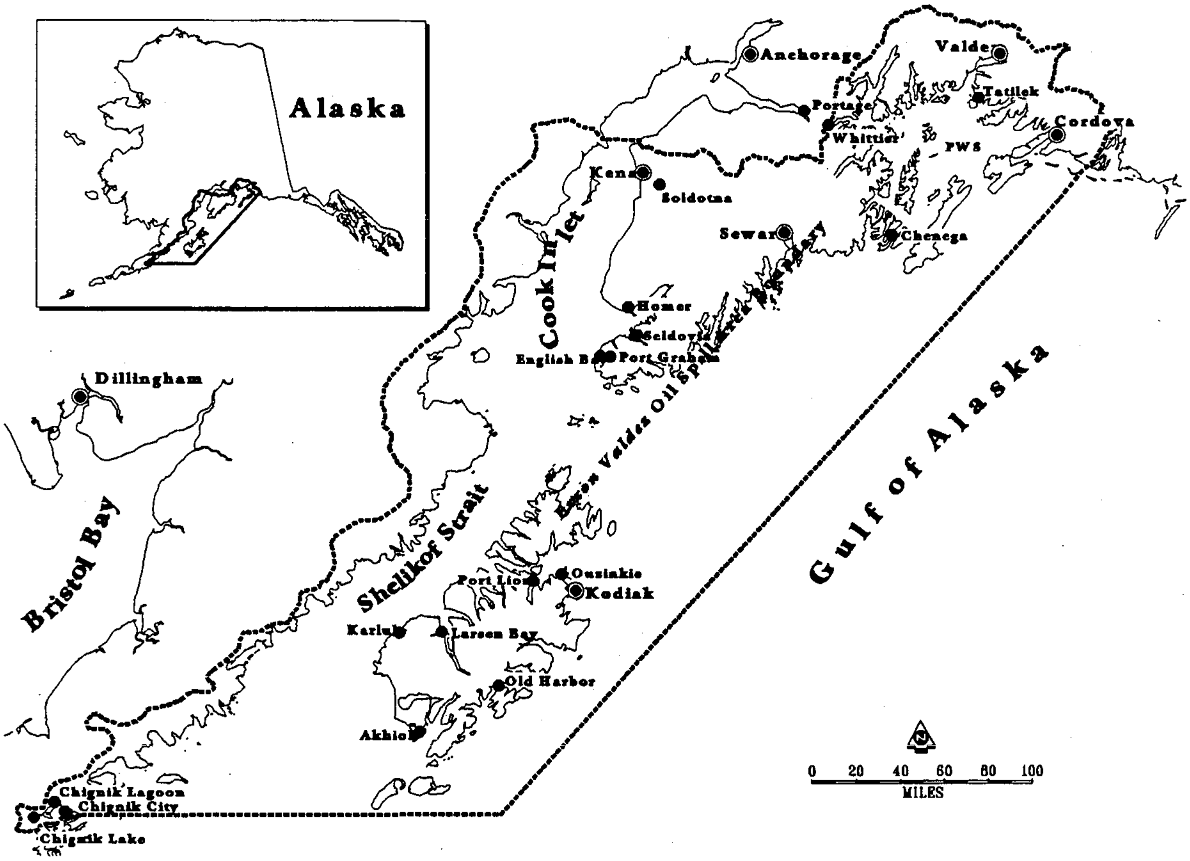

Alaska
Map Area
Prince William Sound
Valdez
Exxon Valdez grounding site
Anchorage
Cook Inlet
Kenai Peninsula
Homer
Day 4 March 27 40 Miles
Day 7 March 30 90 Miles
Day 11 April 3 140 Miles
Day 14 April 7 190 Miles
Day 19 April 11 250 Miles
Day 38 April 30 290 Miles
Day 40 May 2 350 Miles
Day 56 May 18 470 Miles
Gulf of Alaska
Alaska Peninsula
Shelikof Strait
Kodiak
Observed Distribution of Oil
0 20 40 60 80 100
MILES
0 40 80 120 160 200
KILOMETERS

FIG 1-1



Alaska
Anchorage
Valdez
Tatitek
Portage
Whittier
PWS
Cordova
Kenai
Soldotna
Seward
Chenega
Cook Inlet
Homer
Seldovia
English Bay
Port Graham
Exxon Valdez Oil Spill Area Boundary
Gulf of Alaska
Dillingham
Bristol Bay
Shelikof Strait
Port Lions
Ouzinkie
Kodiak
Karluk
Larsen Bay
Old Harbor
Akhiok
Chignik Lagoon
Chignik City
Chignik Lake
0 20 40 60 80 100
MILES

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3-23-94

Short-term effects = immediate changes

Long-term effects = generation

Doesn't matter what the time period is, just so long as there is an ~~d~~ explanation of rationale.

Only deal with the target resource/service. Don't bother with secondary effects. For example: lake fertilization only predict # of fish, don't predict changes in plankton, prey availability etc...

Sea Otter Apr 1

HASE Apr 4

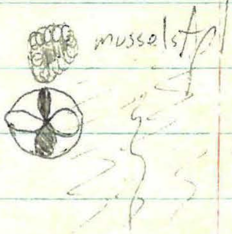
Short-term/long term effects of the combined suite of actions.

Intertidal

Fucus Apr 7

clams

mussels Apr 11



EIS
D

GENERAL RESTORATION BUDGET BREAKDOWN BY IMPACT TOPIC BY ALTERNATIVE							
		Alternatives					
		3 **Limited restoration**		4 **Moderate Restoration**		5 (Proposed Action) **Comprehensive Restoration** (Modified) (draft Restoration Plan)	
Impact topic	"Shares"	Total	Annual	Total	Annual	Total	Annual
Pink Salmon (wild stocks)	3 (2 in Alt. 3)	$3,342,006.00	$417,751.00	$15,386,901.00	$1,923,363.00	$13,053,867.00	$1,631,733.00
Sockeye Salmon (wild stocks)	4	$6,684,012.00	$835,502.00	$20,515,868.00	$2,564,484.00	$17,405,156.00	$2,175,644.00
Pacific herring	3 (2 in Alt. 3)	$3,342,006.00	$417,751.00	$15,386,901.00	$1,923,363.00	$13,053,867.00	$1,631,733.00
Clams	2	$3,342,006.00	$417,751.00	$10,257,934.00	$1,282,242.00	$8,702,578.00	$1,087,822.00
Fucus	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Harbor seals	2	$3,342,006.00	$417,751.00	$10,257,934.00	$1,282,242.00	$8,702,578.00	$1,087,822.00
Sea otters	2	$3,342,006.00	$417,751.00	$10,257,934.00	$1,282,242.00	$8,702,578.00	$1,087,822.00

EIS
D

GENERAL RESTORATION BUDGET BREAKDOWN BY IMPACT TOPIC BY ALTERNATIVE							
		Alternatives					
		3 **Limited restoration**		4 **Moderate Restoration**		5 (Proposed Action) **Comprehensive Restoration** (Modified) (draft Restoration Plan)	
Impact topic	"Shares"	Total	Annual	Total	Annual	Total	Annual
Common murres	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Harlequin duck	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Marbled murrelet	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Pigeon guillemot	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Commercial fishing	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Sport fishing	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Recreation	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Tourism	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Subsistence	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Archaeology	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Designated wilderness	1	$1,671,003.00	$208,875.00	$5,128,967.00	$641,121.00	$4,351,289.00	$543,911.00
Ecosystem	None						
Totals	28 (26 in Alt. 3)	$43,446,081.00		$143,611,080.00		$121,836,097.00	

E/S
D

ALTERNATIVE ___ - ____________

2. Impact on Biological Resources

c. ______________ (Biological Resource; e.g. "Fish")

i. ________________ (Resource i.; e.g., "pink salmon")

+Actions

- Habitat acquisition
- actions already started
-
-

-For each action (e.g., egg boxes):

1. Description

-- Suitable site

-- Operational considerations

2. Potential effects

-- Beneficial

-- Drawbacks

3. Potential applictions

-- PWS, Kodiak, Cook Inlet, Chignik

4. Conclusion (for this action)

+Conclusions (cumulative for all actions)

- short term effects... (one lifecycle)

- long-term effects.... 15 - 20 year... 7 - 10 cycles for odd and even year

ii.________________ (e.g., Sockeye Salmon)

+ Actions

- Habitat acquisition
- actions already started
- Action 1
- Action 2
- etc

+ Conclusions

- short term effects.... one cycle

- long-term effects.... 10 - 50 years... 2 - 10 cycles

iii. etc.

EIS
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February 24, 1994

IMPACT TOPICS AND RELATED PROJECTS

Impact Topics Identified by the public:

All injured resources
Sockeye salmon
Pink salmon
Pacific herring
Subsistence
Recreation
Tourism

The "Brochure" listed the following sets of resources which were injured by the oil spill and categorized the biological resources by whether or not there was a population decline.

Resources and Services Injured by the Oil Spill

RESOURCES			SERVICES (Human Uses)
Population Decline	**Injured, but No Population Decline**	**Other**	
Black oystercatcher Common murre Harbor seal Harlequin duck Intertidal organisms Marbled murrelet Pigeon guillemot Sea otter Sockeye salmon Subtidal organisms	Bald eagle * Cutthroat trout * Dolly Varden * Killer whale Pacific herring * Pink salmon River otter Rockfish	Air, water, and sediments Archaeological resources Designated wilderness areas	Commercial fishing Commercial tourism Passive use Recreation including sport fishing, sport hunting, and other recreation use Subsistence

* For these species, the Trustees' scientists have considerable disagreement over the conclusions to be drawn from the results of the damage assessment studies.

In the draft Restoration Plan released on November 28, 1993, Table B-1, there was a slightly different grouping from that shown in the "Brochure." The injured biological resources were grouped by recovery status not population decline. The other resources and human uses injured are also below.

INJURED RESOURCES			**LOST OR REDUCED SERVICES (Human Uses)**
BIOLOGICAL RESOURCES		**OTHER**	
Recovering Bald eagle Black oystercatcher Intertidal organisms (some) Killer whale Sockeye salmon (Red Lake) Subtidal organisms (some)	**Not recovering** Common murre Harbor seal Harlequin duck Intertidal organisms (some) Marbled murrelet Pacific herring Pigeon guillemot Sea otter Sockeye salmon (Kenai River) Subtidal organisms (some)	Archaeological resources Designated wilderness areas	Commercial fishing Passive use Recreation and Tourism including sport fishing, sport hunting, and other recreation use Subsistence
Recovery Unknown Clams Cutthroat trout Dolly Varden River otter Rockfish			

On consideration of all information to date, the interdisciplinary team (IDT) members made recommendations on how each of the resources should be handled in the EIS process. The following are the IDT recommendations.

Impact Topics which would be dropped from detailed analysis in the EIS are:

Recovering:

- Bald eagle
- Black oystercatcher
- Intertidal organisms (some)
- Killer whale
- Subtidal organisms (some)

Recovery Unknown:

- Cutthroat trout
- Dolly Varden
- River otter
- Rockfish

Human uses:

- Sport hunting
- Passive uses

Those resources which are currently recovering would not be the subject of actions under any of the proposed alternatives with the exception that monitoring and research may be done to assure that the resources do recover. Those resources with a status of recovery unknown which would not be analyzed in the EIS represent minor portion of the various alternatives and thus would have little actions associated with them. The human uses of sport hunting and passive uses would be the subject of actions under any of the alternatives in the EIS. Sport hunting is most directly affected by specific agency regulations of the Alaska Department of Fish and Game (ADF&G). Passive uses would generally benefit from actions taken to restore other uses and resources.

Impact Topics which would be analyzed in the EIS are:

Human uses:

- Commercial fishing 1
- Subsistence 2
- Recreation
- Tourism 3
- Sport fishing 4

Biological Resources:

- Pink Salmon 5
- Sockeye salmon 6
- Pacific herring 7
- Harbor seals 8
- Sea Otters 9
- Clams 10
- Seaweed 11
- Common murres 12
- Harlequin duck 13
- Marbled murrelet 14
- Pigeon Guillemot 15

Other Resources

- Archaeology 16
- ~~Visual resources~~
- Designated wilderness (and wilderness study areas) 17
- Ecosystem (general) ~~18A~~

~~18~~

27 pieces

23%

3,111,428

388,928

504,166

Actions which would be assumed for analysis under the alternatives are:

Monitoring
Research
Education
Food testing

Habitat protection

Migration corridor improvements
Nutrient enrichment
Salmon egg boxes
Net pens
Hatchery rearing
Habitat improvement
Relocation of hatchery runs
Create new fisheries
Enhance or create replacement runs
Enhance existing runs of uninjured pinks and reds

Predator control:
- Fox extermination
- Rat extermination
- Transplant eagles
- Restrict predator access

Recreation/Tourism:
- Construct new facilities
- Improve existing facilities

Clean mussel beds
Transplant *Fucus*
Mariculture clams
Clean sediment

Archaeology:
- Inventory sites
- Excavate sites
- Implement site stewardship program
- Preserve sites (stabilize)
- Acquire replacement artifacts

Facilities:
- Archaeological repository
- Alaska Marine Research Institute
- Waste oil treatment facilities
- Recreation facilities
- Tourism facilities

Endowment for future restoration needs.

Table of Contents

Table of Contents

Continued

Table of Contents

Continued

Table of Contents

Continued

Table of Contents

Continued

List of Tables

Table of Contents

Continued

List of Maps & Figures

EIS
D

Table of Contents

Rod

Bill
Ge[illegible]
Karen
[illegible]

Rod / Karen
Bill / Gerry
Fred

Table of Contents

Continued

everyone

Table of Contents

Continued

KAREN

Fred

Table of Contents

Continued

List of Tables

Follows
Page No.

Chapter 1

Table of Contents

Continued

Table of Contents

List of Maps & Figures

			ALTERNATIVES					
			Alt #2	Alt #3	Alt #4	Alt #5	Alt #6	Options Without An Alternative
Birds								
Bald eagle	37	Purchase private lands (fee title or less th	X			X	X	
Bald eagle	40	Special Designations						Unused
Black oystercatcher	13	Eliminate oil from mussel beds						Unused
Black oystercatcher	14	Accelerate recovery of upper intertidal zone			X		X	
Black oystercatcher	37	Purchase private lands (fee title or less th						Unused
Black oystercatcher	40	Special Designations	X		X		X	
Common murre	4	Reduce disturbance at marine bird colonies a	(Brn Is)		X(Brn Is)		X(Brn Is	
Common murre	16.1	Enhance social stimuli (Common murre)		Sps	Sps	Sps	Sps	
Common murre	16.2	Improve physical characteristics of nest sit						Unused
Common murre	17.2	Reduce predator access to seabird colonies			X		X	
Common murre	33	Public information and education program						Unused
Common murre	37	Purchase private lands (fee title or less th						Unused
Common murre	40	Special Designations						Unused
Harlequin duck	8.1	temporarily restrict/close harvest			X		X	
Harlequin duck	8.2	Ed public to vol restrict hvst			X		X	
Harlequin duck	13	Eliminate oil from mussel beds		X	X	X	X	
Harlequin duck	37	Purchase private lands (fee title or less th	X	X	X	X	X	
Harlequin duck	40	Special Designations						Unused
Marbled murrelet	9	Minimize incidental take of marine birds by		X	X	X	X	
Marbled murrelet	37	Purchase private lands (fee title or less th	X	X	X	X	X	
Marbled murrelet	40	Special Designations	X	X	X	X	X	
Pigeon guillemot	17.2	Reduce predator access to seabird colonies		X	X	X	X	
Pigeon guillemot	37	Purchase private lands (fee title or less th						Unused
Pigeon guillemot	40	Special Designations						Unused
Fish								
Cutthroat trout	2.1	Incease fish/shellfish management: species a				X	X	
Cutthroat trout	11	Improve freshwater wild salmon spawning/rear						Unused
Cutthroat trout	14	Accelerate recovery of upper intertidal zone						Unused
Cutthroat trout	19	Update and expand Alaska's Anadromous Fish S						Unused
Cutthroat trout	37	Purchase private lands (fee title or less th	X			X	X	
Cutthroat trout	40	Special Designations						Unused
Dolly varden trout	2.1	Incease fish/shellfish management: species a				X	X	
Dolly varden trout	11	Improve freshwater wild salmon spawning/rear						Unused
Dolly varden trout	14	Accelerate recovery of upper intertidal zone						Unused
Dolly varden trout	19	Update and expand Alaska's Anadromous Fish S						Unused
Dolly varden trout	37	Purchase private lands (fee title or less th	X				X	
Dolly varden trout	40	Special Designations						Unused
Herring	2.1	Incease fish/shellfish management: species a					X	
Herring	15.1	Supplement intertidal substrates for herring						Unused
Herring	40	Special Designations						Unused
Pink salmon	2.1	Incease fish/shellfish management: species a				X	X	
Pink salmon	11.1	Supplement fry production					X	
Pink salmon	11.2	Improve access to spawning habitat					X	
Pink salmon	11.3	Improve freshwater wild salmon spawning/rear						Unused
Pink salmon	18.?	Move existing hatchery runs				X	X	
Pink salmon	18.1	Establish additional hatchery (salmon) runs.						Unused
Pink salmon	19	Update and expand Alaska's Anadromous Fish S						Unused
Pink salmon	37	Purchase private lands (fee title or less th					X	
Pink salmon	40	Special Designations					X	
Rockfish	2.2	Increase fish/shellfish management: for spec				X	X	
Sockeye salmon	2.1	Increase fish/shellfish management: species a		X(Kenai)	X(Kenai)	X(Kenai)	X(Kenai)	
Sockeye salmon	11	Improve freshwater wild salmon spawning/rear			X(Kdk)		X(Kdk)	
Sockeye salmon	18.1	Establish additional hatchery (salmon) runs						Unused
Sockeye salmon	18.2	Transplant (salmon) hatchery-reared fish to						Unused
Sockeye salmon	18.3	Wild egg take to establish new runs (salmon)						Unused
Sockeye salmon	19	Update and expand Alaska's Anadromous Fish S						Unused
Sockeye salmon	26	Amend Forest Practices Act						Unused
Sockeye salmon	37	Purchase private lands (fee title or less th	X (Kenai)		X(Kenai)		X(Kenai)	
Sockeye salmon	40	Special Designations						Unused
Sockeye salmon - Kenai		supplement fry production		X(Kenai)	X(Kenai)	X(Kenai)	X(Kenai)	
Terrestrial Mammals								
Brown bear	8.1	temporarily restrict/close harvest						Unused
Brown bear	13	Eliminate oil from mussel beds						Unused
Brown bear	37	Purchase private lands (fee title or less th						Unused
Brown bear	40	Special Designations						Unused

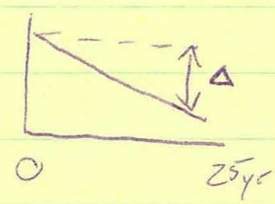
			ALTERNATIVES					Options Without
			Alt #2	Alt #3	Alt #4	Alt #5	Alt #6	An Alternative
River otter	8.1	temporarily restrict/close harvest						Unused
River otter	13	Eliminate oil from mussel beds						Unused
River otter	14	Accelerate recovery of upper intertidal zone						Unused
River otter	37	Purchase private lands (fee title or less th						Unused
River otter	40	Special Designations						Unused
Marine Mammals								
Harbor seal	4	Reduce disturbance at marine bird colonies a	X		X		X	
Harbor seal	8.1	temporarily restrict/close harvest						Unused
Harbor seal	8.2	educate public to voluntarily restrict harve						Unused
Harbor seal*	8.2	Cooperative program with subsistence use		X	X	X	X	
Harbor seal*	8.3	Cooperative program with fishermen		X	X	X	X	
Harbor seal*		Marine Mammal Protection Act						Unused
Harbor seal	40	Special Designations						Unused
Killer whale	4	Reduce disturbance at marine bird colonies a						Unused
Killer whale	40	Special Designations						Unused
Killer Whale - AB pod	45	Change black cod fishery gear		X	X		X	
Sea otter	4	Reduce disturbance	Sps	Sps	Sps	Sps	Sps	
Sea otter	8.1	temporarily restrict/close harvest						Unused
Sea otter	8.2	educate public to voluntarily restrict harve						Unused
Sea otter*	8.2	develop cooperative subsistence program		X	X	X	X	
Sea otter	13	Eliminate oil from mussel beds		Sps	Sps	Sps	Sps	
Sea otter	40	Special Designations	X					
Coastal Habitat								
Upper intertidal	13	Eliminate oil from mussel beds						Unused
Upper intertidal	14	Accelerate recovery of upper intertidal zone		X	X	X	X	
Upper intertidal	40	Special Designations						
Services								
Archaeology	1	Archeological site stewardship program	X	X	X	X	X	
Archaeology	10	Preserve archaeological sites/artifacts	X	X	X	X	X	
Archaeology	35	Acquire archaeologic artifacts from outs			X	X	X	
Commercial Fishing	11.2	Lake fertilization			X		X	
Commercial Fishing	18	Replace fisheries opportunities by alter						Unused
Commercial Fishing	18.1	New Hatchery Runs		X	X	X	X	
Commercial Fishing	18.2	New access/wild runs			X		X	
Recreation	12.11	New backcountry recreation facilities			X	X	X	
Recreation	12.12	New backcountry facilities near existing		X				
Recreation	12.21	New commercial facilities on public land					X	
Recreation	12.22	New comm facilities complementing privat				X		
Recreation	33.11	Education: New visitor centers					X	
Recreation	33.12	Education: Expand existing visitor cente			X	X		
Recreation	33.2	Education: Information package	X	X	X	X	X	
Recreation	34.1	New marine environmental institute					X	
Recreation	34.2	Research Foundation			X	X	X	
Recreation	37	Habitat protection and acquisition	X	X	X	X	X	
Recreation	40	Special Designations	X	X	X	X	X	
Prevention	44	Spill prevention and contingency plannin	X	X	X	X	X	
Sport Fishing	11.2	Lake fertilization			X		X	
Sport Fishing	18.1	Hatchery runs		X	X	X	X	
Sport Fishing	37.1	Sportfishing and recreation access			X		X	
Subsistence	18.1	Hatchery runs			X		X	
Subsistence	18.2	New access/wild runs			X		X	
Subsistence	30.1	Test subsistence foods for hydrocarbon c		X	X	X	X	
Subsistence	30.2	Subsistence food access			X		X	
Subsistence	30.3	Mariculture			X		X	
Subsistence	30.4	Shellfish hatchery			X		X	
Wilderness	37	Habitat protection and acquisition	X	X	X	X	X	
Wilderness	40	Special Designations	X	X	X	X	X	
	18.1	Establish additional hatchery (salmon) r						
Replacement Options								
Seabird Replacement	17.1	Elminate Aleutian Foxes			X	X	X	
Coghill Lake Fertilization	11.2	Fertilize Coghill Lake for Red Salmon			X	X	X	

EIS
D

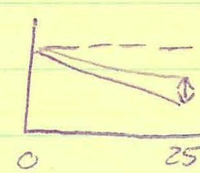
Chapter 3 rewrite

Chapter 1. Purpose & Need
Background
issues
impact topics < included / not included
2. Alternatives & Comparison
3. Affected Environment
4. Environmental Consequences

Within Chapter 4.
Alternative 1 - No Action
1992 → ± stable



Alternative 2 - with Restoration



cumulative effects = TC + other agency/private actions.
long term
unavoidable
section 810 (ANILCA)

Projects consistent with management philosophy of each Alternative.
EXAMPLE PROJECTS

1:00 Monday 14th EIS Impact Topics

Exxon Valdez Trustee Council

2/11/94
8:53 AM

E/S
D

1994 Work P

Resource/Service Objectives

	7 Site-specific Archaeological Restoration - Interagency	15 Archaeological Site Stewardship Program	20 Black Oystercatcher Interaction with Intertidal Communities	39 Common Murre Population Monitoring	40 Education Program to Reduce Disturbance Near Murre Colonies Injured by the Oil Spill	41 Removal of Introduced Predators from Chirikof and Little Koniuji Islands	43 Cutthroat Trout and Dolly Varden Habitat Restoration in PWS, 4 Projects	64 Harbor Seals Habitat Use, Monitoring, Population Modelling, and Information Synthesis	66 Harlequin Duck Recovery Monitoring	68 Deposit Sand on Cleaned Beaches to Promote Clam Recruitment-Feasibility Study	70 Restoration of High-Intertidal Fucus	81 Monitoring for Recruitment of Littleneck Clams	83 Monitoring of Natural Recovery of Oiled and Treated Shorelines	85 Recovery Monitoring of Intertidal Oiled Mussel Beds in PWS and GOA	86 Herring Bay Experimental and Monitoring Studies	90 Restoration of Mussel Beds	92 Recovery Monitoring of Killer Whales in PWS through Photo-Identification	102 Monitor Recovery of Marbled Murrelets Throughout Oil Spill Area	110 Habitat Protection, Data Acquisition and Support	126 Habitat Protection and Acquisition Fund	137 Stock Identification of Chum, Sockeye, and Chinook Salmon in PWS	139 Instream Habitat and Stock Restoration Techniques for Salmon	145 Shoreline Assessment	147 Comprehensive Monitoring Program, Plan and Administer	159 Monitor Marine Bird and Sea Otter Populations - Boat Surveys	163 Abundance and Distribution of Forage Fish and Their Influence on Recovery of Injured Speci	165 Genetic Stock Identification for Herring in PWS	166 Herring Spawn Deposition, Egg Loss, and Reproductive Impairment	173 Pigeon Guillemot Recovery Monitoring	184 Coded Wire Tag Recoveries from Pink Salmon in PWS Salmon Fisheries	185 Coded Wire Tagging of Wild Stock Pink Salmon for Stock Identification	187 Otolith Marking - Inseason Stock Separation Tool to Reduce Wild Salmon Exploitation
Resources Not Recovering:																																
Overall Objectives																																
Conduct research to find out why these resources are not recovering								X	X		X															X	X	X		X	X	
Initiate, sustain or accelerate recovery					X	X					X					X						X									X	
Monitor recovery				X				X	X		X			X				X					X	X	X		X		X	X	X	
Protect injured resources and their habitats					X	X													X	X											X	X
Objectives by Species																																
Common Murres																																
Monitor population recovery*																								X	X							
Identify causes limiting recovery*				X																						X						
Educate the public about the adverse effects of disturbance*					X																											
Protect important common murre colonies*					X	X													X	X												
Reduce predation*						X																										
Harbor Seals																																
Monitor harbor seal population*								X																X	X							
Identify causes limiting recovery*								X																		X						
Identify any sources of human-induced mortality*																																
Identify and protect harbor seal habitats*								X											X	X												
Harlequin Ducks																																
Identify and protect nesting habitat*																			X	X												
Monitor harlequin duck populations*									X															X	X							
Identify causes limiting recovery*									X																							
Monitor and reduce risk of significant human-induced mortality*									X																							
Herring																																
Conduct monitoring and research to better define injury*																								X		X	X	X				
Prevent overharvest of injured stocks*																																
Protect spawning and rearing habitat from damage caused by human activities*																			X	X												
Marbled Murrelets																																
Monitor population recovery*																		X						X	X							
Identify and protect nesting habitat*																			X	X												
Identify and protect food sources and forage areas*																										X						

Reduce risk of human-induced mortality*																																
Pigeon Guillemot																																
Monitor population recovery*																								X	X				X			
Identify causes limiting recovery*																										X						
Protect habitat*																			X	X												
Reduce predation*																																
Pink Salmon																																
Conduct monitoring and research to better define injury*																								X						X	X	
Prevent overharvest of injured wild stocks*																															X	X
Protect spawning and rearing habitat from damage caused by human activities*																			X	X												
Sea Otters																																
Monitor population recovery*																								X	X							
Identify causes that may be limiting recovery*																																
Determine ecosystem relationships of sea otters and intertidal and subtidal invertebrates*																																
Sockeye Salmon (Kenai River)																																
Monitor recovery*																																
Restore production of fry and smolt*																																
Reduce the risk of adult overescapement and underescapement*																																
Protect spawning and rearing habitat from damage caused by human activities*																			X	X												
Resources Recovery Unknown:																																
Overall Objectives																																
Rely on natural recovery																																
Monitor recovery							X					X		X	X									X								
Protect injured resources and their habitats							X												X	X												
Objectives by Species																																
Clams (Intertidal Organisms)																																
Monitor and restore clam beds*												X																				
Monitor baseline intertidal sites*												X																				
Dolly Varden and Cutthroat Trout																																
Monitor Dolly Varden and cutthroat trout populations*							X																	X								
Protect habitat*							X												X	X												
River Otter																																
Monitor river otters*																								X								
Rockfish																																
Monitor rockfish population*																								X								
Recovering Resources:																																
Overall Objectives																																
Rely on natural recovery																																
Monitor recovery			X																				X	X	X							
Protect injured resources and their habitats																			X	X												
Objectives by Species																																
Bald Eagles																																
Monitor bald eagle populations*																							X									
Identify and protect habitat*																			X	X												
Black Oystercatchers																																
Monitor population recovery*			X																				X	X								
Evaluate ecological relationships*																																
Reduce predation*																																
Killer Whales																																
Monitor AB pod composition and organization*																	X						X									
Sockeye Salmon (Red Lake)																																
Monitor population recovery*																																
Restore production of fry and smolt*																																
Protect spawning and rearing habitat from damage caused by human activities*																			X	X												
Other Resources																																
Archaeological Resources																																
Monitor sites*																							X									
Stop archaeological site deterioration*	X																															
Protect archaeological sites and artifacts*	X	X																	X	X												
Repair spill-related injury to archaeological sites and artifacts	X																															

Protect sites and artifacts from further injury and store them in appropriate facilities	X	X																														
Designated Wilderness																																
Preserve or improve the wilderness value of designated wilderness areas																			X	X			X									
Services																																
Commercial Fishing																																
Restore injured populations of commercial fish*																											X			X	X	X
Consider creating new or enhanced salmon runs if injured populations are not recovering*																						X										
Promote recovery of commercial fishing as soon as possible																					X	X					X				X	X
Protect commercial fish resources from further degradation																			X	X	X										X	X
Monitor recovery*																								X		X	X			X	X	
Subsistence																																
Restore injured populations of subsistence species*								X		X											X	X				X						
Increase confidence in the safety of traditional foods*																																
Remove oil that continues to contaminate subsistence foods*																X																
Increase the availability of alternative food sources or their equivalents while injured resources are recovering*										X																						
Protect habitat important to subsistence resources from damage caused by human activities*																			X	X												
Promote recovery of subsistence as soon as possible								X		X											X	X				X						
Reduce hydrocarbon levels in subsistence foods to background levels and minimize the risk of reoiling																X																
Protect subsistence resources from further degradation																			X	X												
Monitor recovery								X																X								
Recreation and Tourism																																
Preserve or improve the recreational value of the spill area					X		X																									
Remove surface oil from beaches frequently used for recreation and tourism																																
Passive Uses																																
None																																
Ecosystem Objectives																																
Habitat Protection																																
Marine Environments																																
Identify important marine habitats*																																
Protect important marine habitats*																			X	X												
Upland Environments																																
Identify important upland habitats*																																
Protect important upland habitats*																			X	X												
Ecosystem Monitoring and Research																																
Forage Fishes																																
Monitor forage fish stocks*																								X		X	X					
Assess the impacts of changing abundance of forage fish*																										X						
Intertidal Organisms																																
Monitor and restore mussels and clam beds*										X				X		X								X								
Evaluate the indirect ecosystem effects arising from a change in key intertidal organisms*											X		X											X								
Determine how changes in intertidal organisms influence recovery of other resources*									X		X		X											X								
Monitor baseline intertidal sites*													X	X	X								X	X								
Restore sediments on cleanup treatment beaches*										X																						
Plankton																																
Identify the natural functions of planktonic regimes*																								X								
Determine the effects of trophic interactions on the recruitment of key fish species*																								X		X						
Evaluate important prey species in lakes*																																
Subtidal Organisms																																
Monitor hydrocarbon levels in fish and sediments*																								X								
Monitor algae and invertebrates*															X									X								
Evaluate the indirect effect of reductions in predation on subtidal organisms*																								X								
	4	2	2	2	5	4	5	8	6	5	5	3	3	4	3	4	1	2	21	21	4	5	8	27	8	12	7	2	2	5	10	6

* - shading designates objectives from Proposed Appendix D to the Draft Restoration Plan. Other objectives are from the October 22, 1993 Draft Restoration Plan.

an Projects

																								X			X		189 PWS Pink Salmon Stock Genetics
																									X		X		191 Investigating and Monitoring Oil Related Egg and Alevin Mortalities, Lab and Field Work
																									X		X		192 Evaluation, Enumeration and effects of Hatchery Straying on Wild Pink Salmon in PWS
															I	I					I						I		199 Seward Sea Life Center
																													200 17(b) Easement Identification-Public Land Access
																													216 Development of Gulf of Alaska Recreation Plan
																													217 Implement Prince William Sound Area Recreation Plan
																													237 River Otter Recovery Monitoring
																													241 Develop a Rockfish Management Plan
														X		X								X	X	X	X		244 Harbor Seal and Sea Otter Cooperative Subsistence Harvest Assistance
																									X		X		246 Monitoring of Sea Otter Population Abundance, Distribution, Reproduction, and Mortality
																								X		X			255 Kenai River Sockeye Salmon Restoration
																									X		X		258 Sockeye Salmon Overescapement
																													259 Restoration of the Coghill Lake Sockeye Salmon Stock
																													260 Red Lake Salmon Restoration
																													266 Shoreline Oil Removal
																													272 Chenega Chinook and Coho Release Program
																													273 Port Graham Salmon Hatchery
																													277 Village Mariculture Project - Oyster Farming
																													279 Subsistence Food Safety Testing
																													280 Spot Shrimp Survey and Juvenile Spot Shrimp Habitat Identification
																									X				285 Recovery Monitoring of Hydrocarbon-Contaminated Subtidal Marine Sediment Resources
									X																X		X		290 Hydrocarbon Data Analysis and Interpretation
																													316 Shoreline Trash Cleanup for Oil Spill Area
																													320 Baseline Scientific Research - Ecosystem Study Plan
																									X		X		345 Evaluation and Enumeration Projects for the Streams on the Lower Kenai Peninsula
																													386 Artifact Repository and Cultural Centers, Planning, Site Selection and Design (PWS and GOA)
																													417 Waste Oil Disposal Facilities and Hazardous Waste Disposal Plan
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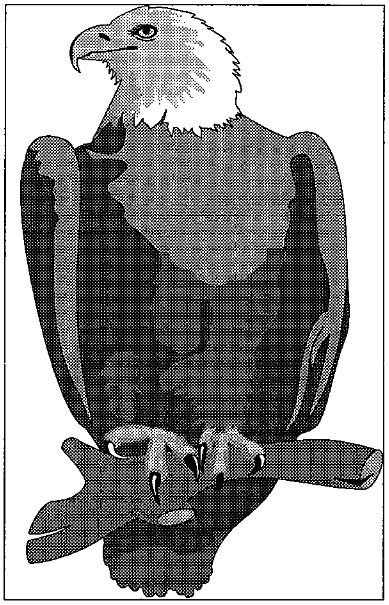

Resource/Service Objectives

Resources Not Recovering:

Objective	9 Heritage Information Replacement	12 Study of Petroleum Hydrocarbon Spectra at Selected Sites	16 Chugach National Forest Heritage Interpretive Center, Design	25 Fishery Industrial Technology Center	27 Susitna River Sockeye Salmon Production Evaluation	30 Recovery of Coded-Wire Gags from Pink Salmon in Commercial Catches, Hatchery Cost Recover	31 Wild Fish Stock Information Assessment	48 Oil Spill Restoration Support Service and Facilities	57 PWS Scenic Byway - Nomination and Interpretive Plan	61 Monitoring Trends in Abundance of Harbor Seals in PWS	67 Quantification of Stream Habitat for Harlequin Ducks from Remotely Sensed Data	69 Fucus Restoration Feasibility Study	71 Beach Subsurface Oil Recovery	73 Rapid Restoration of Weathered Crude Contaminated Beach Subsurface Material
Overall Objectives														
Conduct research to find out why these resources are not recovering														
☮☮ Initiate, sustain or accelerate recovery														
Monitor recovery														
☮☮ Protect injured resources and their habitats														
Objectives by Species														
Common Murres														
☮☮ Monitor population recovery*														
☮☮ Identify causes limiting recovery*														
☮☮ Educate the public about the adverse effects of disturbance*														
☮☮ Protect important common murre colonies*														
☮☮ Reduce predation*														
Harbor Seals														
☮☮ Monitor harbor seal population*														
☮☮ Identify causes limiting recovery*														
☮☮ Identify any sources of human-induced mortality*														
☮☮ Identify and protect harbor seal habitats*														
Harlequin Ducks														
☮☮ Identify and protect nesting habitat*														
☮☮ Monitor harlequin duck populations*														
Identify causes limiting recovery*														
☮☮ Monitor and reduce risk of significant human-induced mortality*														
Herring														
☮☮ Conduct monitoring and research to better define injury*														
☮☮ Prevent overharvest of injured stocks*														
☮☮ Protect spawning and rearing habitat from damage caused by human activities*														
Marbled Murrelets														
☮☮ Monitor population recovery*														
☮☮ Identify and protect nesting habitat*														
☮☮ Identify and protect food sources and forage areas*														
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Pigeon Guillemot														
☮☮ Monitor population recovery*														
☮☮ Identify causes limiting recovery*														
☮☮ Protect habitat*														
☮☮ Reduce predation*														
Pink Salmon														
☮☮ Conduct monitoring and research to better define injury*														

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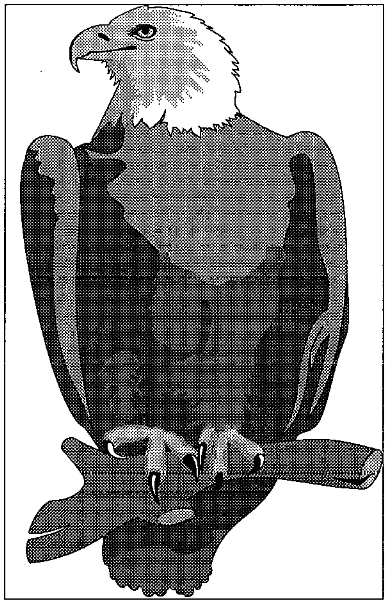

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Resource/Service Objectives														
Prevent overharvest of injured wild stocks*														
Protect spawning and rearing habitat from damage caused by human activities*														
Sea Otters														
Monitor population recovery*														
Identify causes that may be limiting recovery*														
Determine ecosystem relationships of sea otters and intertidal and subtidal invertebrates*														
Sockeye Salmon (Kenai River)														
Monitor recovery*														
Restore production of fry and smolt*														
Reduce the risk of adult overescapement and underescapement*														
Protect spawning and rearing habitat from damage caused by human activities*														
Resources Recovery Unknown:														
Overall Objectives														
Rely on natural recovery														
Monitor recovery														
Protect injured resources and their habitats														
Objectives by Species														
Clams (Intertidal Organisms)														
Monitor and restore mussels and clam beds*														
Monitor baseline intertidal sites*														
Dolly Varden and Cutthroat Trout														
Monitor Dolly Varden and cutthroat trout populations*														
Protect habitat*														
River Otter														
Monitor river otters*														
Rockfish														
Monitor rockfish population*														
Recovering Resources:														
Overall Objectives														
Rely on natural recovery*														
Monitor recovery*														
Protect injured resources and their habitats*														
Objectives by Species														
Bald Eagles														
Monitor bald eagle populations*														
Identify and protect habitat*														
Black Oystercatchers														
Monitor population recovery*														
Evaluate ecological relationships*														

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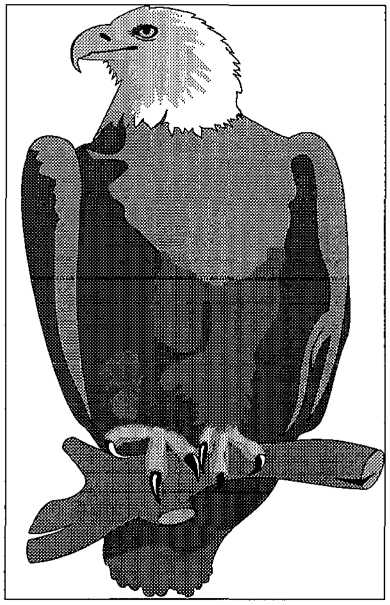

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Resource/Service Objectives														
Reduce predation*														
Killer Whales														
Monitor AB pod composition and organization*														
Sockeye Salmon (Red Lake)														
Monitor population recovery*														
Restore production of fry and smolt*														
Protect spawning and rearing habitat from damage caused by human activities*														
Other Resources														
Archaeological Resources														
Monitor sites*														
Stop archaeological site deterioration*														
Protect archaeological sites and artifacts*														
Repair spill-related injury to archaeological sites and artifacts														
Protect sites and artifacts from further injury and store them in appropriate facilities														
Designated Wilderness														
Preserve or improve the wilderness value of designated wilderness areas														
Services														
Commercial Fishing														
Restore injured populations of commercial fish*														
Consider creating new or enhanced salmon runs if injured populations are not recovering*														
Promote recovery of commercial fishing as soon as possible*														
Protect commercial fish resources from further degradation*														
Monitor recovery*														
Subsistence														
Restore injured populations of subsistence species*														
Increase confidence in the safety of traditional foods*														
Remove oil that continues to contaminate subsistence foods*														
Increase the availability of alternative food sources or their equivalents while injured resources are recovering*														
Protect habitat important to subsistence resources from damage caused by human activities*														
Promote recovery of subsistence as soon as possible														
Reduce hydrocarbon levels in subsistence foods to background levels and minimize the risk of reoiling														
Protect subsistence resources from further degradation														
Monitor recovery														
Recreation and Tourism														
Preserve or improve the recreational value of the spill area														
Remove surface oil from beaches frequently used for recreation and tourism														
Passive Uses														
None														
Ecosystem Objectives														

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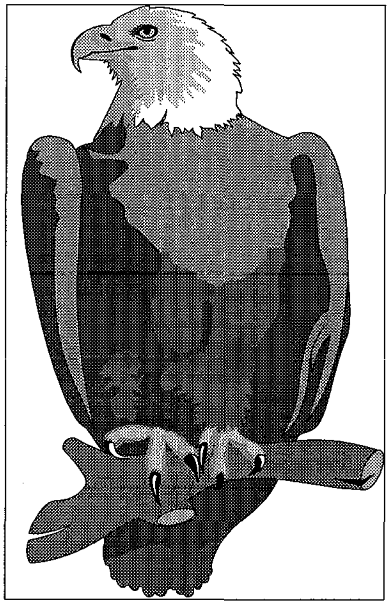

Resource/Service Objectives	9 Heritage Information Replacement	12 Study of Petroleum Hydrocarbon Spectra at Selected Sites	16 Chugach National Forest Heritage Interpretive Center, Design	25 Fishery Industrial Technology Center	27 Susitna River Sockeye Salmon Production Evaluation	30 Recovery of Coded-Wire Gags from Pink Salmon in Commercial Catches, Hatchery Cost Recover	31 Wild Fish Stock Information Assessment	48 Oil Spill Restoration Support Service and Facilities	57 PWS Scenic Byway - Nomination and Interpretive Plan	61 Monitoring Trends in Abundance of Harbor Seals in PWS	67 Quantification of Stream Habitat for Harlequin Ducks from Remotely Sensed Data	69 Fucus Restoration Feasibility Study	71 Beach Subsurface Oil Recovery	73 Rapid Restoration of Weathered Crude Contaminated Beach Subsurface Material
Habitat Protection														
Marine Environments														
Identify important marine habitats*														
Protect important marine habitats*														
Upland Environments														
Identify important upland habitats*														
Protect important upland habitats*														
Ecosystem Monitoring and Research														
Forage Fishes														
Monitor forage fish stocks*														
Assess the impacts of changing abundance of forage fish*														
Intertidal Organisms														
Monitor and restore mussels and clam beds*														
Evaluate the indirect ecosystem effects arising from a change in key intertidal organisms*														
Determine how changes in intertidal organisms influence recovery of other resources*														
Monitor baseline intertidal sites*														
Restore sediments on cleanup treatment beaches*														
Plankton														
Identify the natural functions of planktonic regimes*														
Determine the effects of trophic interactions on the recruitment of key fish species*														
Evaluate important prey species in lakes*														
Subtidal Organisms														
Monitor hydrocarbon levels in fish and sediments*														
Monitor algae and invertebrates*														
Evaluate the indirect effect of reductions in predation on subtidal organisms*														
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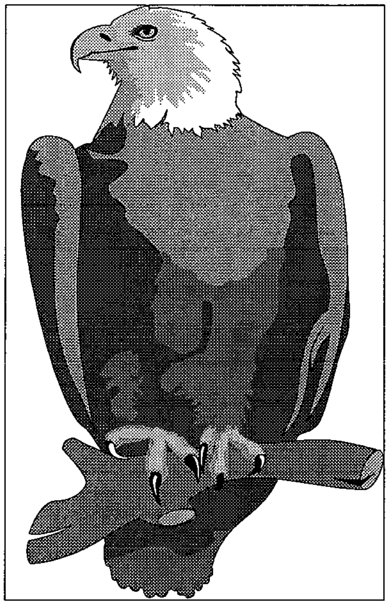

Resource/Service Objectives

Resources Not Recovering:

Objective	92 Photo-identification Studies of Killer Whales	118 Acquire Olsen Bay Watershed	125 Conservation Easement - Rocky Bay	140 Alaska Land and Wildlife Conservation Fund	142 Oil Spill Injured Resources Literature Research and Review	144 Identification of Seabird Feeding Areas from Remotely Sensed Data and Impact on Restoration	181 Waterfall Creek Pink Salmon Restoration - Fish Improvement	204 Shelter Cover, Cordova Restoration Project	212 Prince William Sound Campground	248 Sea Otter Population Dynamics	256 Lower Cook Inlet Sockeye Salmon Restoration and Enhancement	259 Restoration of the Coghill Lake Sockeye Salmon Stock	266 Chenega Bay Subsistence Restoration Project (Remove Oil)	270 Surveys of Impacted Native Communities - Subsistence
Overall Objectives														
Conduct research to find out why these resources are not recovering														
⊗⊗ Initiate, sustain or accelerate recovery														
Monitor recovery														
⊗⊗ Protect injured resources and their habitats														
Objectives by Species														
Common Murres														
⊗⊗ Monitor population recovery*														
⊗⊗ Identify causes limiting recovery*														
⊗⊗ Educate the public about the adverse effects of disturbance*														
⊗⊗ Protect important common murre colonies*														
⊗⊗ Reduce predation*														
Harbor Seals														
⊗⊗ Monitor harbor seal population*														
⊗⊗ Identify causes limiting recovery*														
⊗⊗ Identify any sources of human-induced mortality*														
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Identify causes limiting recovery*														
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Herring														
⊗⊗ Conduct monitoring and research to better define injury*														
⊗⊗ Prevent overharvest of injured stocks*														
⊗⊗ Protect spawning and rearing habitat from damage caused by human activities*														
Marbled Murrelets														
⊗⊗ Monitor population recovery*														
⊗⊗ Identify and protect nesting habitat*														
⊗⊗ Identify and protect food sources and forage areas*														
⊗⊗ Reduce risk of human-induced mortality*														
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⊗⊗ Reduce predation*														
Pink Salmon														
⊗⊗ Conduct monitoring and research to better define injury*														

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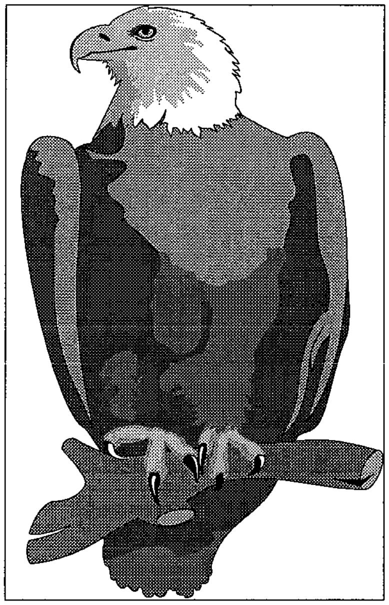

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Black Oystercatchers														
Monitor population recovery*														
Evaluate ecological relationships*														

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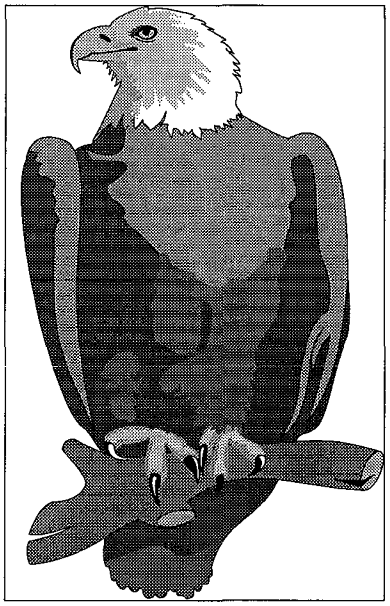

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Resource/Service Objectives														
⊗⊗ Reduce predation*														
Killer Whales														
Monitor AB pod composition and organization*	X													
Sockeye Salmon (Red Lake)														
⊗⊗ Monitor population recovery*														
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⊗⊗ Protect sites and artifacts from further injury and store them in appropriate facilities														
Designated Wilderness														
Preserve or improve the wilderness value of designated wilderness areas													X	
Services														
Commercial Fishing														
⊗⊗ Restore injured populations of commercial fish*														
Consider creating new or enhanced salmon runs if injured populations are not recovering*												X		
Promote recovery of commercial fishing as soon as possible*												X		
⊗⊗ Protect commercial fish resources from further degradation*														
⊗⊗ Monitor recovery*														
Subsistence														
⊗⊗ Restore injured populations of subsistence species*														
Increase confidence in the safety of traditional foods*														
Remove oil that continues to contaminate subsistence foods*													X	
⊗⊗ Increase the availability of alternative food sources or their equivalents while injured resources are recovering*														
⊗⊗ Protect habitat important to subsistence resources from damage caused by human activities*														
Promote recovery of subsistence as soon as possible														
Reduce hydrocarbon levels in subsistence foods to background levels and minimize the risk of reoiling													X	
⊗⊗ Protect subsistence resources from further degradation														
⊗⊗ Monitor recovery														
Recreation and Tourism														
Preserve or improve the recreational value of the spill area														
Remove surface oil from beaches frequently used for recreation and tourism													X	
Passive Uses														
None														
Ecosystem Objectives														

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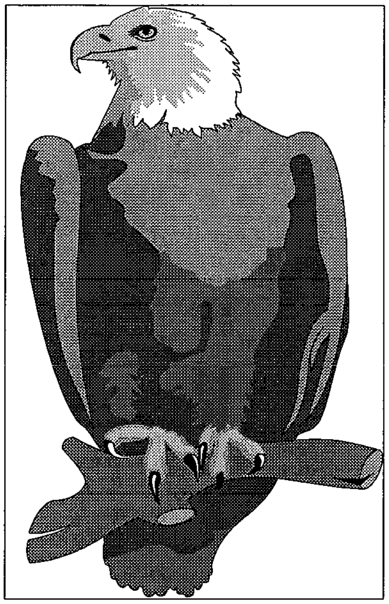

Resource/Service Objectives

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Habitat Protection														
Marine Environments														
Identify important marine habitats*														
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Identify important upland habitats*														
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Ecosystem Monitoring and Research														
Forage Fishes														
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Monitor and restore mussels and clam beds*														
Evaluate the indirect ecosystem effects arising from a change in key intertidal organisms*														
Determine how changes in intertidal organisms influence recovery of other resources*														
Monitor baseline intertidal sites*														
Restore sediments on cleanup treatment beaches*													X	
Plankton														
Identify the natural functions of planktonic regimes*														
Determine the effects of trophic interactions on the recruitment of key fish species*														
Evaluate important prey species in lakes*														
Subtidal Organisms														
Monitor hydrocarbon levels in fish and sediments*														
Monitor algae and invertebrates*														
Evaluate the indirect effect of reductions in predation on subtidal organisms*														
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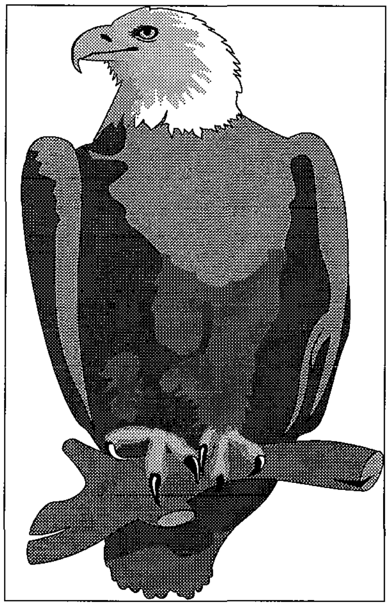


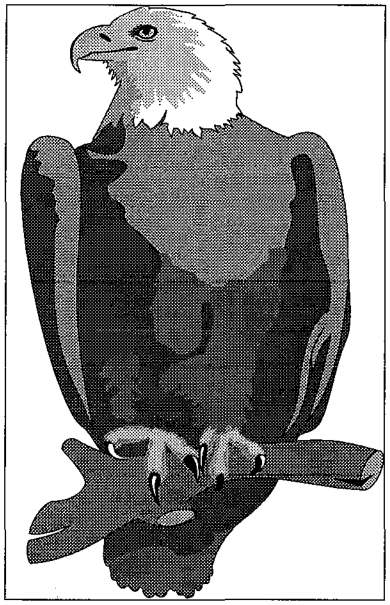
Resource/Service Objectives

Resources Not Recovering:

Overall Objectives

Objective	273 Port Graham Salmon Hatchery	279 Subsistence Food Safety Testing	290 Hydrocarbon Data Analysis and Interpretation	295 Providing Public Access to Oilspill GIS Databases Using Arcview in PC Windows Environment	297 User-Friendly GIS and Remote Sensing Demonstration Center for Public-5 Communities	304 Acquisition in PWS is Very Important	315 Acquisition - Habitat in PWS, No Clear Cutting	353 Fund 3 Academic Chairs for Recreation Planning and Management of U of A	367 Fund One Academic Chair in Bald Eagle Ecology at UAS	370 Fund One Academic Chair in Trout Ecology at U of A	381 LCI Sockeye Salmon Evolution	388 Occurrence of Natural Oil Seeps in PWS	391 Pink and Chum Salmon Restoration Surveys (Lower Cook Inlet)	400 Restore Intertidal Chum Salmon at Port Dick and Rocky River
Conduct research to find out why these resources are not recovering			X											
⊗⊗ Initiate, sustain or accelerate recovery														
Monitor recovery			X											
⊗⊗ Protect injured resources and their habitats														
Objectives by Species														
Common Murres														
⊗⊗ Monitor population recovery*														
⊗⊗ Identify causes limiting recovery*														
⊗⊗ Educate the public about the adverse effects of disturbance*														
⊗⊗ Protect important common murre colonies*														
⊗⊗ Reduce predation*														
Harbor Seals														
⊗⊗ Monitor harbor seal population*														
⊗⊗ Identify causes limiting recovery*														
⊗⊗ Identify any sources of human-induced mortality*														
⊗⊗ Identify and protect harbor seal habitats*														
Harlequin Ducks														
⊗⊗ Identify and protect nesting habitat*														
⊗⊗ Monitor harlequin duck populations*														
Identify causes limiting recovery*			X											
⊗⊗ Monitor and reduce risk of significant human-induced mortality*														
Herring														
⊗⊗ Conduct monitoring and research to better define injury*														
⊗⊗ Prevent overharvest of injured stocks*														
⊗⊗ Protect spawning and rearing habitat from damage caused by human activities*														
Marbled Murrelets														
⊗⊗ Monitor population recovery*														
⊗⊗ Identify and protect nesting habitat*														
⊗⊗ Identify and protect food sources and forage areas*														
⊗⊗ Reduce risk of human-induced mortality*														
Pigeon Guillemot														
⊗⊗ Monitor population recovery*														
⊗⊗ Identify causes limiting recovery*														
⊗⊗ Protect habitat*														
⊗⊗ Reduce predation*														
Pink Salmon														
⊗⊗ Conduct monitoring and research to better define injury*														

Exxon Valdez Trustee Council



Objectives	273 Port Graham Salmon Hatchery	279 Subsistence Food Safety Testing	390 Hydrocarbon Data Analysis and Interpretation	295 Providing Public Access to Oilspill GIS Databases Using Arcview in PC Windows Environment	297 User-Friendly GIS and Remote Sensing Demonstration Center for Public-5 Communities	304 Acquisition in PWS is Very Important	315 Acquisition - Habitat in PWS, No Clear Cutting	353 Fund 3 Academic Chairs for Recreation Planning and Management of U of A	367 Fund One Academic Chair in Bald Eagle Ecology at UAS	370 Fund One Academic Chair in Trout Ecology at U of A	381 LCI Sockeye Salmon Evolution	388 Occurrence of Natural Oil Seeps in PWS	391 Pink and Chum Salmon Restoration Surveys (Lower Cook Inlet)	400 Restore Intertidal Chum Salmon at Port Dick and Rocky River
Resource/Service Objectives														
Reduce predation*														
Killer Whales														
Monitor AB pod composition and organization*														
Sockeye Salmon (Red Lake)														
Monitor population recovery*														
Restore production of fry and smolt*														
Protect spawning and rearing habitat from damage caused by human activities*														
Other Resources														
Archaeological Resources														
Monitor sites*														
Stop archaeological site deterioration*														
Protect archaeological sites and artifacts*														
Repair spill-related injury to archaeological sites and artifacts														
Protect sites and artifacts from further injury and store them in appropriate facilities														
Designated Wilderness														
Preserve or improve the wilderness value of designated wilderness areas														
Services														
Commercial Fishing														
Restore injured populations of commercial fish*														
Consider creating new or enhanced salmon runs if injured populations are not recovering*	X													
Promote recovery of commercial fishing as soon as possible*	X													
Protect commercial fish resources from further degradation*														
Monitor recovery*														
Subsistence														
Restore injured populations of subsistence species*														
Increase confidence in the safety of traditional foods*		X	X											
Remove oil that continues to contaminate subsistence foods*														
Increase the availability of alternative food sources or their equivalents while injured resources are recovering*														
Protect habitat important to subsistence resources from damage caused by human activities*														
Promote recovery of subsistence as soon as possible	X	X												
Reduce hydrocarbon levels in subsistence foods to background levels and minimize the risk of reoiling			X											
Protect subsistence resources from further degradation														
Monitor recovery														
Recreation and Tourism														
Preserve or improve the recreational value of the spill area	X													
Remove surface oil from beaches frequently used for recreation and tourism														
Passive Uses														
None														
Ecosystem Objectives														

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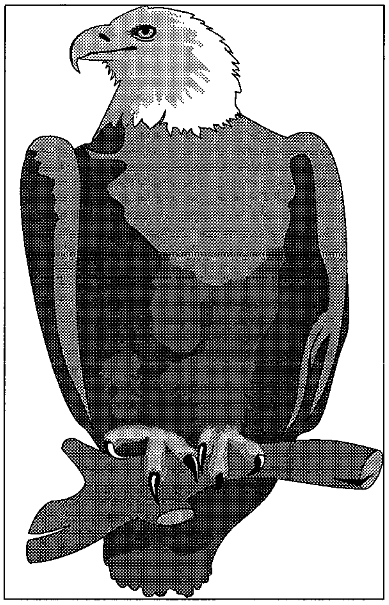

Resource/Service Objectives

Objective	273 Port Graham Salmon Hatchery	279 Subsistence Food Safety Testing	290 Hydrocarbon Data Analysis and Interpretation	295 Providing Public Access to Oilspill GIS Databases Using Arcview in PC Windows Environment	297 User-Friendly GIS and Remote Sensing Demonstration Center for Public-5 Communities	304 Acquisition in PWS is Very Important	315 Acquisition - Habitat in PWS, No Clear Cutting	353 Fund 3 Academic Chairs for Recreation Planning and Management of U of A	367 Fund One Academic Chair in Bald Eagle Ecology at UAS	370 Fund One Academic Chair in Trout Ecology at U of A	381 LCI Sockeye Salmon Evolution	388 Occurrence of Natural Oil Seeps in PWS	391 Pink and Chum Salmon Restoration Surveys (Lower Cook Inlet)	400 Restore Intertidal Chum Salmon at Port Dick and Rocky River
Habitat Protection														
Marine Environments														
Identify important marine habitats*														
Protect important marine habitats*														
Upland Environments														
Identify important upland habitats*														
Protect important upland habitats*														
Ecosystem Monitoring and Research														
Forage Fishes														
Monitor forage fish stocks*														
Assess the impacts of changing abundance of forage fish*														
Intertidal Organisms														
Monitor and restore mussels and clam beds*			X											
Evaluate the indirect ecosystem effects arising from a change in key intertidal organisms*														
Determine how changes in intertidal organisms influence recovery of other resources*														
Monitor baseline intertidal sites*			X											
Restore sediments on cleanup treatment beaches*														
Plankton														
Identify the natural functions of planktonic regimes*														
Determine the effects of trophic interactions on the recruitment of key fish species*														
Evaluate important prey species in lakes*														
Subtidal Organisms														
Monitor hydrocarbon levels in fish and sediments*			X											
Monitor algae and invertebrates*														
Evaluate the indirect effect of reductions in predation on subtidal organisms*														
	4	2	8	0	0	0	0	0	0	0	0	0	0	0

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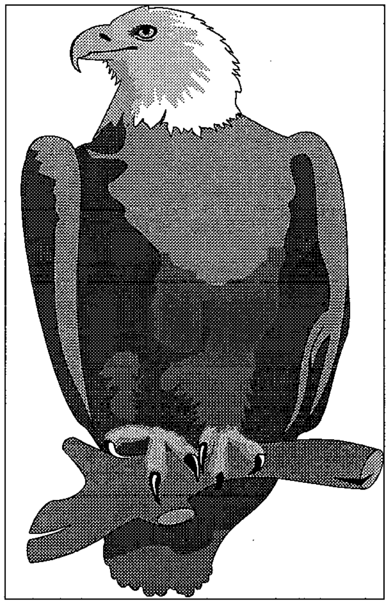

Resource/Service Objectives

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Resources Not Recovering:

Overall Objectives

Conduct research to find out why these resources are not recovering	1
Initiate, sustain or accelerate recovery	0
Monitor recovery	1
Protect injured resources and their habitats	0

Objectives by Species

Common Murres	
Monitor population recovery*	0
Identify causes limiting recovery*	0
Educate the public about the adverse effects of disturbance*	0
Protect important common murre colonies*	0
Reduce predation*	0
Harbor Seals	
Monitor harbor seal population*	0
Identify causes limiting recovery*	0
Identify any sources of human-induced mortality*	0
Identify and protect harbor seal habitats*	0
Harlequin Ducks	
Identify and protect nesting habitat*	0
Monitor harlequin duck populations*	0
Identify causes limiting recovery*	1
Monitor and reduce risk of significant human-induced mortality*	0
Herring	
Conduct monitoring and research to better define injury*	0
Prevent overharvest of injured stocks*	0
Protect spawning and rearing habitat from damage caused by human activities*	0
Marbled Murrelets	
Monitor population recovery*	0
Identify and protect nesting habitat*	0
Identify and protect food sources and forage areas*	0
Reduce risk of human-induced mortality*	0
Pigeon Guillemot	
Monitor population recovery*	0
Identify causes limiting recovery*	0
Protect habitat*	0
Reduce predation*	0
Pink Salmon	
Conduct monitoring and research to better define injury*	0

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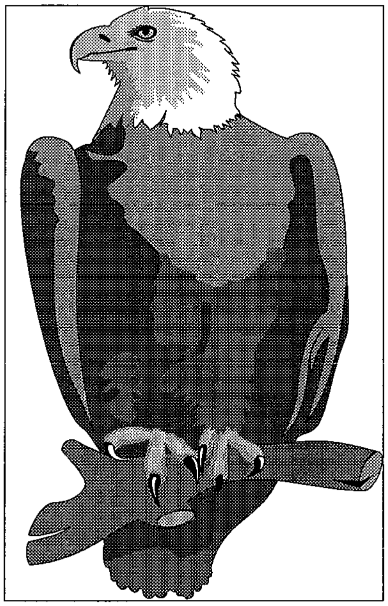

Resource/Service Objectives

	42
Prevent overharvest of injured wild stocks*	0
Protect spawning and rearing habitat from damage caused by human activities*	0
Sea Otters	
Monitor population recovery*	0
Identify causes that may be limiting recovery*	0
Determine ecosystem relationships of sea otters and intertidal and subtidal invertebrates*	0
Sockeye Salmon (Kenai River)	
Monitor recovery*	0
Restore production of fry and smolt*	0
Reduce the risk of adult overescapement and underescapement*	0
Protect spawning and rearing habitat from damage caused by human activities*	0

Resources Recovery Unknown:

Overall Objectives

Rely on natural recovery	0
Monitor recovery	0
Protect injured resources and their habitats	0

Objectives by Species

Clams (Intertidal Organisms)	
Monitor and restore mussels and clam beds*	0
Monitor baseline intertidal sites*	0
Dolly Varden and Cutthroat Trout	
Monitor Dolly Varden and cutthroat trout populations*	0
Protect habitat*	0
River Otter	
Monitor river otters*	0
Rockfish	
Monitor rockfish population*	0

Recovering Resources:

Overall Objectives

Rely on natural recovery*	0
Monitor recovery*	0
Protect injured resources and their habitats*	0

Objectives by Species

Bald Eagles	
Monitor bald eagle populations*	0
Identify and protect habitat*	0
Black Oystercatchers	
Monitor population recovery*	0
Evaluate ecological relationships*	0

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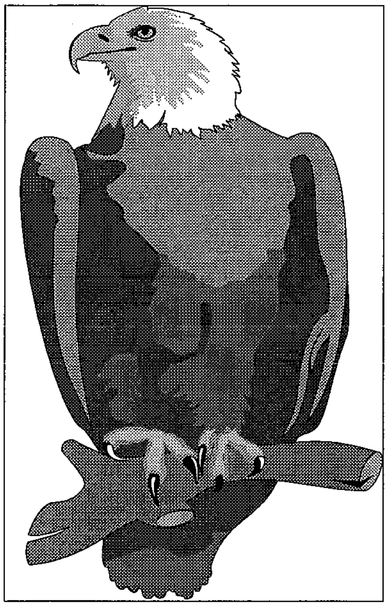

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Resource/Service Objectives	
⊗⊗ Reduce predation*	0
Killer Whales	
Monitor AB pod composition and organization*	1
Sockeye Salmon (Red Lake)	
⊗⊗ Monitor population recovery*	0
⊗⊗ Restore production of fry and smolt*	0
⊗⊗ Protect spawning and rearing habitat from damage caused by human activities*	0
Other Resources	
Archaeological Resources	
⊗⊗ Monitor sites*	0
⊗⊗ Stop archaeological site deterioration*	0
⊗⊗ Protect archaeological sites and artifacts*	0
⊗⊗ Repair spill-related injury to archaeological sites and artifacts	0
⊗⊗ Protect sites and artifacts from further injury and store them in appropriate facilities	0
Designated Wilderness	0
Preserve or improve the wilderness value of designated wilderness areas	1
Services	
Commercial Fishing	
⊗⊗ Restore injured populations of commercial fish*	0
Consider creating new or enhanced salmon runs if injured populations are not recovering*	2
Promote recovery of commercial fishing as soon as possible*	2
⊗⊗ Protect commercial fish resources from further degradation*	0
⊗⊗ Monitor recovery*	0
Subsistence	
⊗⊗ Restore injured populations of subsistence species*	0
Increase confidence in the safety of traditional foods*	2
Remove oil that continues to contaminate subsistence foods*	1
⊗⊗ Increase the availability of alternative food sources or their equivalents while injured resources are recovering*	0
⊗⊗ Protect habitat important to subsistence resources from damage caused by human activities*	0
Promote recovery of subsistence as soon as possible	2
Reduce hydrocarbon levels in subsistence foods to background levels and minimize the risk of reoiling	2
⊗⊗ Protect subsistence resources from further degradation	0
⊗⊗ Monitor recovery	0
Recreation and Tourism	
Preserve or improve the recreational value of the spill area	1
Remove surface oil from beaches frequently used for recreation and tourism	1
Passive Uses	
None	
Ecosystem Objectives	

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Pink salmon	2.3 Intensify management 11.1 Construct salmon spawning channels 11.3 Improve access: salmon fish passes 19.0 Anadromous Streams Catalogue 37.0 Habitat protection and acquisition 40.0 Special designations 48.0 Improve survival rates of salmon eggs and juveniles 51.0 Relocate existing hatchery runs
River otter	8.0 Develop sport and trapping harvest guidelines
Rockfish	2.4 Intensify management
Archaeology	1.1 Site stewardship program 1.2 Site patrol and monitoring 10.0 Preserve archaeological sites and artifacts 35.0 Acquire replacements for artifacts from the spill area
Commercial fishing	11.2 Fertilize lakes to improve sockeye salmon rearing success 18.0 Replace salmon harvest opportunities
Recreation	12.1 New backcountry public recreation facilities 12.2 Plan and market public land for commercial rec facilities 33.1 Visitor centers 34.0 Marine environmental institute 37.0 Habitat protection and acquisition 40.0 Special designations
Sport fishing	11.2 Fertilize lakes to improve sockeye salmon rearing success 18.0 Replace salmon harvest opportunities
Subsistence	18.0 Replace salmon harvest opportunities 30.0 Test subsistence foods 49.0 Access to traditional foods 50.1 Develop subsistence mariculture sites 50.2 Develop bivalve shellfish hatchery and rescue center
Wilderness	37.0 Habitat protection and acquisition 40.0 Special designations
Multiple resources	44.0 Spill prevention and contingency planning

Table ____. Restoration Options for Alternative 5.

EVALUATION

I. EFFECT ON THE RECOVERY OF RESOURCES:

A. MARINE MAMMALS

Harbor seals (first priority): At present, disturbance of harbor seals at their haulout sites is not believed to be a significant problem, therefore reducing disturbance at marine

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U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region. North Aleutian Basin (Sale 92): Graphic 3, marine mammals. Map.

U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region. North Aleutian Basin (Sale 92): Graphic 4, endangered species. Map.

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U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region. 1984. Navarin Basin lease offering: Graphic 4, marine mammals. Map.

U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region. 1984. Navarin Basin lease offering: Graphic 5, endangered whales. Map.

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Summary of Comments on the Proposed Consent Decree, DOJ, CACI.

EIS
D

MEMORANDUM **STATE OF ALASKA**

FOR: *Exxon Valdez* Oil Spill Restoration Plan -- Environmental Impact Statement

TO: EIS Writing Team

DATE: March 2, 1994

PHONE: 907/278-8012, ext 254
FAX: 907/276-7178

SUBJECT: Planning

FROM: William J. Hauser Bill
ADF&G - CFMD Division
645 G Street
Anchorage, AK 99501

Hello.

This has been an interesting and challenging 2 weeks and, though I have been learning all sorts of things about all sorts of things, I know that I have a long way to go. A few bits and pieces, however, seem to be starting to fall into place.

Attached is a DRAFT outline of what has been emerging as my idea of what I think that I will be contributing to the EIS. I will greatly appreciate any of your comments to help me along and, where we will interact, I do not want any of you to be surprised by the information or the format. What am I missing in this "timeframe"? I still don't know enough to know if this should feel comfortable or if I should be very nervous.

For the most part, I have benefited greatly by our meetings; and, though I usually loathe the thought of more meetings, I meekly suggest that more may be useful..... provided there is a good agenda.

Thank you for your help.

Let's talk.

Bill.

DRAFT

March 2, 1994
fn:outline

FISHERIES TASKS TO BE ADDRESSED IN THE "PROGRAMMATIC" EIS

1. Focus for the EIS will be on the program umbrella

- "Generic"
- Not project specific
- Specific projects will probably need an EA

2. Affected Environment (Ch. 3)/ Impact Topics (Ch. 4)/ "Issues"/ Injured Resource

- Pink salmon... PWS
- Sockeye salmon... Kenai Drainage and Akalura Lake
- Commercial fishing... PWS, Cook Inlet, Kodiak
- Sport fishing... PWS
- Pacific Herring *
- Cutthroat trout *
- Dolly Varden *

* Not addressed... (no proposed "Action")

3. Target Audience

- Trustee Council
- J. Q. Public... whoever wishes to comment

4. Global "Actions" included for most "Alternatives"

- Habitat acquisition and protection
- Research and monitoring
- Discussion not part of Fisheries tasks

5. Planning Assumptions

- Must be developed
- For "generic" implications
- Must be very carefully qualified
- I do not want to make <u>paper</u> fish

6. Actions that may be included for an "Alternative"

a. "Options" for restoration actions
b. May not necessarily be cost/beneficial
a. Wild stocks
- Migration corridor improvements

- Egg incubation boxes
- Net pen rearing for fry
- Hatchery rearing
- Habitat improvement
- Relocation of hatchery runs
- Eyed-egg planting
- Lake nutrient enrichment

b. Hatchery
- Enhance existing run or create new "replacement" run
- Enhance existing runs of uninjured pink and sockeye salmon
- Create new sport fisheries

7. Discuss rationale for the different "Actions" (Ch. 2?)

a. Concept of "Limiting Factor"
- Controls number of fish
- If it ain't broke, it don't do no good to fix it

b. Survival rate data from literature
c. Describe and discuss the "technologies" of the actions
d. Philosophy of application of the technologies of the actions
- Changes in survival rates - data from literature
- Affects on limiting factors and fish production

8. Discuss implications and "forecast" of each "Action" for each "Alternative"

- Not: pros vs cons; or judgmental; or benefits vs negatives
- May include; e.g.,
  - increase fish for harvest and use
  - contribute to food web
  - relieve pressure on wild stocks
  - potential overharvest in mixed stock fishery
  - genetic dilution
  - straying effects on genetics
  - disease transmission
  - increase survival of eggs; or, fry; etc.
  - "generic" benefit/cost
  - Δ in recovery time. (RANGE IN YEARS)

9. Consider policies and controls

- ADF&G Genetics policy
- ADF&G Fish Transport Permit
- ADF&G Sockeye salmon culture policy
- Aquatic habitat permits: ADF&G, DEC, COE, FWS, etc.
- Regional Planning Teams
- Annual Hatchery Management Plans
- Describe typical planning process

Very short - couple sentences

10. Factors that may influence analysis

- Location relative to the Oil Spill Area
- Amount of money available (depends on)
  alternative
  location relative to spill area
  severity of damage

11. Timeframe

a. 12 September ---- **Final EIS to printer.**
 - Final edit of EIS
b. 23 August ---- **Trustee Council approve Preliminary EIS**
 - Interagency review--- meetings?
c. 12 August --- **Trustee Council briefing on comments**
 - Edit and incorporate comments
d. 1 August --- End 45-day public comment period
 - Public comment period ---- attend meetings????
 - Review comments and revise
e. 17 June --- **Start public comment period**
f. 20 May ---- **Draft EIS to printer**
 - prepare draft
g. 9 May --- **Trustee Council approve Draft EIS**
 - Interagency review--- meetings???
 - prepare and edit Draft EIS
h. 28 March --- complete first rough Draft EIS

EIS
D

~~4,399,956~~

4 3,560,000   2,420,000   1,893,913

÷ 28 = 1,555,714   3,787,826

1) All Resources should get some $
" Services " " " "

2) Resources important to Com. fish and subsistence should get more $

3) Actions for some R/S are much more expensive than for others.

4) Some resources have more restoration opportunities than others.

We could divide the GR pie evenly (what about resources we are not considering in this EIS?)

165,000,000
÷ 28

5,892,857

17,678,571 sockeye
11,773,928 for actions
$1,681,989.7/year until 2002

561,168

E 1S
D

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
AR001	INTERIM RPT	OS01	1991	30015862	30015932	911127	OFC OF HISTORY & ARCHAEOLOGY, DNR	INTERIM RPT EVOS ARCHAEOLOGICAL DAMAGE ASSESSMENT ON STATE LAND
AR001	FINAL RPT	OS02	1991	30439420	30439613	910226	SHETTEL, DON L;MIFFLIN & ASSOC;USFS;DNR	STATE / FED FUNDING - EVOS DAMAGE ASSESSMENT CONTAMINATION OF ARCHEOLOGICAL MATERIALS, CHUGACH NATL FOREST - RADIOCARBON EXPERIMENTS & RELATED ANALYSES - FINAL RPT # ARCHEOLOGY STUDY NO 1
AR001	FINAL RPT	OS07	1991	30286573	30286719	920800	DNR;REGER, DOUGLAS R; MCMAHAN, J DAVID;HOLMES, CHARLES E	EFFECT OF CRUDE OIL CONTAMINATION ON SOME ARCHAEOLOGICAL SITES IN THE GULF OF AK 1991 INVESTIGATIONS
AR001	FINAL RPT	OS08	1991	30437477	30437832	930611	RESEARCH FOUNDATION OF THE STATE UNI OF NY; DEKIN, ALBERT A;CASSELL, MARK S;EBERT, JAMES I; CAMILLI, EILEEN;KERLEY, JANET M;YARBOROUGH, MICHAEL R;STAHL, PETER A; TURCY, BETH L;GREEN, LESLIE	EVOS ARCHAEOLOGICAL DAMAGE ASSESSMENT # FINAL RPT
AR001	FINAL RPT	OS10	1991	30287099	30287701	930930	DEKIN, ALBERT A;CASSELL, MARK S;EBERT, JAMES I; CAMILLI, EILEEN;KERLEY, JANET M;YARBOROUGH, MICHAEL R;STAHL, PETER A; TURCY, BETH L;GREEN, LESLIE;RESEARCH FOUNDATION OF THE STATE OF NY	EVOS ARCHAEOLOGICAL DAMAGE ASSESSMENT # FINAL RPT - VOL III - APPENDICES E-M
AW001	DETAIL PLAN	OS01		8144080	8144090	891006	DEC;UAF;NOAA;KENDZIOREK, MARSHAL	STATE / FED NRDA DETAILED STUDY PLAN GEOGRAPHIC EXTENT, TEMPORAL PERSISTENCE & MAPPING OF FLOATING OIL FROM THE T / V EVOS - AIR / WATER NO 1

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
AW002	DETAIL PLAN	OS01	1989	8573684	8573699	891002	ADFG; DEC; DIR; DNR; DOI; EPA; LINDSTROM, JON; NOAA; OSIAR; PROGRAM MANAGER; PROVANT, SG; SENIOR BIOMETRICIAN; UAF; WEINER, ART	STATE / FED NRDA DETAILED STUDY PLAN - PETROLEUM HYDROCARBON - INDUCED INJURY TO SUBTIDAL MARINE SEDIMENT RESOURCES # AIR WATER STUDY NO 2 - INCLUDES APPENDIX I
AW002	DETAIL PLAN	OS01	1989	30416356	30416376	891006	RICE, STANLEY D;OCLAIR, CHARLES E;LINDSTROM, JON; WEINER, ART;SHAW, DAVID G	PETROLEUM HYDROCARBON-INDUCED INJURY TO SUBTIDAL MARINE SEDIMENT RESOURCES
AW002	INTERIM RPT	OS03	1989	30449358	30449371	900116	RICE, STANLEY D;OCLAIR, CHARLES E;LINDSTROM, JON; WEINER, ART;SHAW, DAVID G;NOAA;DEC;UAF;NMFS	STATE / FED NRDA PRELIMINARY STATUS RPT - PETROLEUM HYDROCARBON-INDUCED INJURY TO SUBTIDAL MARINE SEDIMENT RESOURCES # AIR / WATER STUDY NO 2
AW002	DETAIL PLAN	OS01	1990	526149	526158	900306	NOAA; VARANASI, USHA	ECDS STUDY PLAN FOR AIR WATER NO 2 UVF ANALYSES & MICROTOX BIOASSAYS # ENCLOSURE OF STUDY PLAN
AW002	DETAIL PLAN	OS01	1990	526159	526189	900311	DEC; FEDER, HOWARD M; LINDSTROM, JON; NMFS; OCLAIR, CHARLES E; RATHBONE, DEBORAH; RICE, STANLEY D; SNYDER, GEORGE; UAF; VARANASI, USHA; WEINER, ART	STATE / FED NRDA DETAILED STUDY PLAN - 1990 PETROLEUM HYDROCARBON INDUCED INJURY TO SUBTIDAL MARINE SEDIMENT RESOURCES AIR WATER STUDY NO 2 # STUDY PLAN DATES: MAR 15 1990 - FEB 28 1991
AW002	INTERIM RPT	OS02	1990	30090644	30090693	900000	FEDER, HOWARD M	INJURY TO DEEP BENTHOS - STATUS RPT 1990 # AIR / WATER STUDY NO 2
AW002	INTERIM RPT	OS02	1990	30090618	30090643	901100	RICE, STANLEY D;OCLAIR, CHARLES E;NOAA	NRDA DRAFT STATUS RPT - PETROLEUM HYDROCARBON-INDUCED INJURY TO SUBTIDAL MARINE SEDIMENT RESOURCES # AIR / WATER STUDY NO 2
AW002	DETAIL PLAN	OS03	1991	30449347	30449357	000000	RICE, STANLEY D;OCLAIR,	PETROLEUM

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							CHARLES E;NOAA;UAF	HYDROCARBON-INDUCED INJURY TO SUBTIDAL MARINE SEDIMENT RESOURCES # AIR / WATER STUDY NO 2
AW002	INTERIM RPT	OS01	1991	30024891	30025155	911100	FEDER, HOWARD	STATUS RPT 1991 INJURY TO DEEP BENTHOS # AIR / WATER STUDY NO 2, PROJECT NO 2109
AW003	DETAIL PLAN	OS05	1989	5982782	5982815	891002	LINDSTROM, JON;WEINER, ART;DEC;NOAA;EPA;USDI; NPS;DNR;UAF	STATE / FED NRDA DETAILED STUDY - GEOGRAPHIC & TEMPORAL DISTRIBUTION OF DISSOLVED & PARTICULATE PETROLEUM HYDROCARBONS IN THE WATER COLUMN # AIR / WATER STUDY NO 3
AW003	DETAIL PLAN	OS01	1989	30416377	30416400	891010	SHORT, JEFFREY W; LINDSTROM, JON	GEOGRAPHIC & TEMPORAL DISTRIBUTION OF DISSOLVED & PARTICULATE PETROLEUM HYDROCARBONS IN THE WATER COLUMN
AW003	INTERIM RPT	OS03	1989	30449328	30449339	900112	SHORT, JEFFREY W; LINDSTROM, JON;NMFS;DEC	STATE / FED NRDA PRELIMINARY STATUS RPT - GEOGRAPHIC & TEMPORAL DISTRIBUTIONS OF DISSOLVED & PARTICULATE PETROLEUM HYDROCARBONS IN THE WATER COLUMN # AIR / WATER STUDY NO 3
AW003	DETAIL PLAN	OS01	1990	526214	526230	900312	DEC; EVSRC; LINSTROM, JOHN; NMFS; RATHBONE, DEBORAH; RICE, STANLEY D; SHORT, JEFFREY W; SNYDER, GEORGE	STATE / FED NRDA DETAILED STUDY PLAN - 1990 GEOGRAPHIC & TEMPORAL DISTRIBUTION OF DISSOLVED & PARTICULATE PETROLEUM HYDROCARBONS IN THE WATER COLUMN # AIR WATER STUDY NO 3
AW003	INTERIM RPT	OS02	1990	30090710	30090715	000000	SALE, DAVID;MCROY, PETER; GIBEAUT, JIM;DEC	CERCLA / NRDA STUDIES - GEOGRAPHIC DISTRIBUTION OF DISSOLVED & PARTICULATE HYDROCARBONS IN THE WATER COLUMN (SUBTIDAL SEDIMENT

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								TRAPS) # AIR / WATER STUDY NO 3
AW003	INTERIM RPT	OS02	1990	30090694	30090709	901100	SHORT, JEFFREY;ROUNDS, PATRICIA;NOAA	NRDA DRAFT STATUS RPT - GEOGRAPHIC & TEMPORAL DISTRIBUTION OF DISSOLVED & PARTICULATE PETROLEUM HYDROCARBONS IN THE WATER COLUMN # AIR / WATER STUDY NO 3
AW004	INTERIM RPT	OS05	1989	5581640	5581667	900112	BRADDOCK, JOAN F; BROWN, EDWARD J; CALDER, JOHN; CASILLAS, EDMUNDO; FEDER, HOWARD; LUNZ, JOHN D; MEARNS, ALAN J; NOAA; SCIENCE APPLICATIONS INTL; UNI OF AK; WOLFE, DOUGLAS A	DRAFT PRELIMINARY STATUS RPT - PETROLEUM EXPOSURE & INJURY TO INFAUNAL RESOURCES # AIR / WATER STUDY NO 4
AW005	DETAIL PLAN	OS01	1989	131117	131120	891005	GUAY, GERALD A	STATE / FED NRDA DETAILED STUDY PLAN INJURY TO THE AIR RESOURCE FROM THE RELEASE OF OIL GENERATED VOLATILE ORGANIC COMPOUNDS # AIR / WATER STUDY NO 5
AW005	INTERIM RPT	OS05	1989	5581702	5581704	900000		STATE / FED NRDA PRELIMINARY STATUS RPT - INJURY TO THE AIR RESOURCES FROM THE RELEASE OF OIL GENERATED VOLATILE ORGANIC COMPOUNDS # AIR / WATER STUDY NO 5
AW006	DETAIL PLAN	OS03	1990	30449292	30449319	900514	WOLFE, DOUGLAS A;NOAA	FATE & TOXICITY OF SPILLED OIL FROM THE EXXON VALDEZ # AIR / WATER STUDY NO 6
AW006	INTERIM RPT	OS02	1990	30090716	30090733	901107	WOLFE, DOUGLAS A;NOAA	DRAFT PRELIMINARY STATUS RPT - FATE & TOXICITY OF SPILLED OIL FROM THE EXXON VALDEZ # AIR / WATER STUDY NO 6
AW006	DETAIL PLAN	OS03	1991	30449278	30449291	910201	WOLFE, DOUGLAS A;NOAA	FATE & TOXICITY OF SPILLED

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								OIL FROM THE EXXON VALDEZ # AIR / WATER STUDY NO 6
BD001	DETAIL PLAN	OS01	1989	9147817	9147828	891020	WOHL, KENT;DENLINGER, LYNN M;LEEDY, ROBERT R; BOWDEN, DAVID C	BEACHED BIRD SURVEY # ATTACHING DETAILED STUDY PLAN
BD001	INTERIM RPT	OS01	1989	30422112	30422125	900112	WOHL, KENT;DENLINGER, LYNN;USFWS	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOS - BEACHED BIRD SURVEYS IN PWS & THE GULF OR AK
BD001	INTERIM RPT	OS01	1990	30422496	30422525	901127	ECOLOGICAL CONSULTING	AN ASSESSMENT OF DAMAGE TO SEABIRDS IN PWS & THE WESTERN GULF OF AK RESULTING FROM THE EVOS
BD001	INTERIM RPT	OS01	1990	30422880	30423125	910300	ECOLOGICAL CONSULTING	ASSESSMENT OF SEABIRD MORTALITY IN PWS & THE WESTERN GULF OF AK RESULTING FROM THE EVOS
BD001	FINAL RPT	OS01	1991	30423264	30423499	910600	ECOLOGICAL CONSULTING	ASSESSMENT OF DIRECT SEABIRD MORTAILITY IN PWS & THE WESTERN GULF OF AK RESULTING FROM THE EVOS
BD002	DETAIL PLAN	OS01	1989	373754	373765	891020	KLOSIEWSKI, STEVEN P; HOTCHKISS, LEE A;USFWS; WOHL, KENTON DON D;LEEDY, ROBERT R;BOWDEN, DAVID C	SURVEYS TO DETERMINE DISTRIBUTION & ABUNDANCE OF MIGRATORY BIRDS IN PWS & THE N GULF OF AK # NRDA BIRD STUDY NO 2
BD002	INTERIM RPT	OS01	1989	30423648	30423713	900112	KLOSIEWSKI, STEVEN P; HOTCHKISS, LEE A;USFWS	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOS - SURVEYS TO DETERMINE DISTRIBUTION & ABUNDANCE OF MIGRATORY BIRDS IN PWS & THE NORTHERN GULF OF AK
BD002	INTERIM RPT	OS01	1990	30432096	30432299	901119	HOTCHKISS, LEE A	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOS - SURVEYS TO DETERMINE DISTRIBUTION & ABUNDANCE OF MIGRATORY BIRDS IN PWS & THE NORTHERN GULF OF AK #

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								BD002A
BD002	INTERIM RPT	OS01	1990	30432480	30432526	901226	LAING, KAREN	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOSS - BOAT SURVEYS TO DETERMINE DISTRIBUTION & ABUNDANCE OF MIGRATORY BIRDS IN PWS & THE NORTHERN GULF OF AK # BD002B
BD002	INTERIM RPT	OS01	1991	30433248	30433306	911122	LAING, KAREN;USFWS	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOS - BOAT SURVEYS TO DETERMINE DISTRIBUTION & ABUNDANCE OF MIGRATORY BIRDS IN PWS
BD002	INTERIM RPT	OS01	1990	30432864	30432885	910200	KULETZ, KATHY;USFWS	ASSESSMENT OF INJURY TO NEARSHORE ALCIDS FROM THE EVOS - EFFECTS ON MARBLED MURRELETS & GUILLEMOTS - ADDENDUM TO BIRD STUDY BD002B
BD003	DETAIL PLAN	OS01	1989	9147841	9147848	890300	WOHL, KENT;NYSEWANDER, DAVID R;LEEDY, ROBERT R; BOWDEN, DAVID C	POPULATION SURVEYS OF SEABIRD NESTING COLONIES IN PWS, THE OUTSIDE COAST OF THE KENAI PENINSULA, BARREN ISLANDS & OTHER NEARBY COLONIES # ATTACHING DETAILED STUDY PLAN
BD003	DETAIL PLAN	OS01	1990	7981143	7981152	901130	NYSEWANDER, DAVID;DIPPEL, CHRIS	POPULATION SURVEYS OF SEABIRD NESTING COLONIES IN PWS, THE OUTSIDE COAST OF THE KENAI PENINSULA, BARREN ISLANDS & OTHER NEARBY COLONIES, WITH EMPHASIS ON CHANGES OF NUMBERS & REPRODUCTION OF MURRES
BD003	INTERIM RPT	OS01	1989	30433632	30433663	900112	NYSEWANDER, DAVID	POPULATION SURVEYS OF SEABIRD NESTING COLONIES IN PWS, THE OUTSIDE COAST OF THE KENAI PENINSULA, BARREN ISLANDS & OTHER NEARBY COLONIES

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
BD003	INTERIM RPT	OS01	1990	30434016	30434063	901119	NYSEWANDER, DAVID;DIPPEL, CHRIS	POPULATION SURVEYS OF SEABIRD NESTING COLONIES IN PWS, THE OUTSIDE COAST OF THE KENAI PENINSULA, BARREN ISLANDS, & OTHER NEARBY COLONIES, WITH EMPHASIS ON CHANGES OF NUMBERS & REPRODUCTION OF MURRES
BD003	INTERIM RPT	OS01	1991	30434400	30434469	911122	NYSEWANDER, DAVID;DIPPEL, CHRIS	POPULATION SURVEYS OF SEABIRD NESTING COLONIES IN PWS, THE OUTSIDE COAST OF THE KENAI PENINSULA, BARREN ISLANDS, & OTHER NEARBY COLONIES, WITH EMPHASIS ON CHANGES OF NUMBERS & REPRODUCTION OF MURRES
BD004	DETAIL PLAN	OS01	1989	9147849	9147868	890300	SCHEMPF, PHILIP F;LEEDY, ROBERT R;BOWDEN, DAVID C	ASSESSING THE EFFECTS OF THE EVOS ON BALD EAGLES # ATTACHING DETAILED STUDY PLAN
BD004	INTERIM RPT	OS01	1989	30434784	30434791	900112	SCHEMPF, PHILIP F;BOWMAN, TIMOTHY D	ASSESSING THE EFFECTS OF THE EVOS ON BALD EAGLES
BD004	INTERIM RPT	OS01	1990	30435168	30435217	901119	SCHEMPF, PHILIP F;BOWMAN, TIMOTHY D;BERNOWICZ, JEFFREY;SCHUMACHER, THOMAS	ASSESSING THE EFFECTS OF THE EVOS ON BALD EAGLES
BD004	DETAIL PLAN	OS01	1991	9291327	9291340	910300	SCHEMPF, PHILIP F;ADFG	ASSESSING THE EFFECTS OF THE EVOS ON BALD EAGLES # BIRD STUDY NO 4 - ATTACHING APPENDIX A & B
BD004	INTERIM RPT	OS01	1991	30435552	30435625	911122	SCHEMPF, PHILIP F;BOWMAN, TIMOTHY D	ASSESSING THE EFFECT OF THE EVOS ON BALD EAGLES
BD004	INTERIM RPT	OS01	1991	30435936	30436018	911122	SCHEMPF, PHILIP F;BOWMAN, TIMOTHY D	ASSESSING THE EFFECT OF THE EVOS ON BALD EAGLES # REVISED 920512
BD005	DETAIL PLAN	OS01	1989	5983324	5983341	891023	HUGHES, JEFFREY H;ADFG	STATE / FED NRDA DETAILED STUDY PLAN, APR 1989 - FEB

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								1990 IMPACT ASSESSMENT OF EVOS ON PEALES PEREGRINE FALCONS - BIRD STUDY NO 5
BD005	DETAIL PLAN	OS01	1990	594014	594032	900312	ADFG; HUGHES, JEFFREY H; USFWS	STATE / FED NRDA DETAILED STUDY PLAN - MAR 1990 - FEB 1991 IMPACT ASSESSMENT OF THE EVOS ON PEALES PEREGRINE FALCONS
BD005	INTERIM RPT	OS01	1989	30436320	30436331	900112	HUGHES, JEFFREY H;ADFG	IMPACT OF THE EVOS ON THE PEALE'S PEREGRINE FALCONS
BD005	INTERIM RPT	OS01	1990	30436704	30436711	901127	HUGHES, JEFFREY H	NRDA STATUS RPT - BIRD STUDY NO 5 (PEREGRINE FALCONS)
BD006	DETAIL PLAN	OS01	1989	373812	373823	891020	KULETZ, KATHY J;USFWS; LEEDY, ROBERT R;BOWDEN, DAVID C	ASSESSMENT OF INJURY TO MARBLED MURRELETS AT SITES ALONG THE KENAI PENINSULA & PWS # NRDA BIRD STUDY NUMBER 6
BD006	INTERIM RPT	OS01	1989	30437088	30437109	900112	KULETZ, KATHY;USFWS	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOS - EFFECTS ON POPULATIONS OF MARBLED MURRELETS ALONG THE KENAI PENISULA & PWS
BD006	INTERIM RPT	OS01	1991	30437472	30437476	911122	KULETZ, KATHY;USFWS	A PRELIMINARY SUMMARY OF THE EXXON VALDEZ DAMAGE ASSESSMENT STUDIES ON THE MARBLED MURRELET # NOT A FULL RPT
BD006	INTERIM RPT	OS01	1991	30437856	30437918	920205	KULETZ, KATHY;USFWS	ASSESSMENT OF INJURY TO MARBLED MURRELETS FROM THE EVOS - BIRD STUDY NO 6 (1989), SUPPLEMENTAL TO BIRD STUDY NO 2 (1990), SUPPLEMENTAL TO RESTORATION NO 4 (1991) - DRAFT
BD006	INTERIM RPT	OS01	1991	30438240	30438304	920205	KULETZ, KATHY;USFWS	ASSESSMENT OF INJURY TO MARBLED MURRELETS FROM THE EVOS - BIRD STUDY NO 6 (

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								1989), SUPPLEMENTAL TO BIRD STUDY NO 2 (1990), SUPPLEMENTAL TO RESTORATION NO 4 (1991) - DRAFT # REVISED 920512
BD007	DETAIL PLAN	OS01	1989	373824	373833	891023	NISHIMOTO, MIKE;USFWS; WOHL, KENTON D;LEEDY, ROBERT R;BOWDEN, DAVID C	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOS, EFFECTS OF PETROLEUM HYDROCARBON ON FORK TAILED STORM PETREL REPRODUCTIVE SUCCESS # NRDA BIRD STUDY NUMBER 7
BD007	INTERIM RPT	OS01	1989	30438624	30438645	900112	NISHIMOTO, MIKE	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOS - EFFECTS ON PETROLEUM HYDROCARBON ON FROK-TAILED STORM-PETREL REPRODUCTIVE SUCCESS
BD008	DETAIL PLAN	OS01	1989	9147909	9147959	890300	WOHL, KENT;IRONS, DAVID; LEEDY, ROBERT R;BOWDEN, DAVID C	ASSESSMENT OF INJURY TO WATERBIRDS FROM EVOS, EFFECTS ON THE REPRODUCTIVE SUCCESS OF BLACKLEGGED KITTIWAKES IN PWS # ATTACHING DETAILED STUDY PLAN
BD008	INTERIM RPT	OS01	1989	30439008	30439021	900112	IRONS, DAVID	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOS - EFFECTS ON THE REPRODUCTIVE SUCCESS OF BLACK-LEGGED KITTIWAKES IN PWS
BD009	DETAIL PLAN	OS01	1989	9147984	9147996	890300	WOHL, KENT;OAKLEY, KAREN; LEEDY, ROBERT R;BOWDEN, DAVID C	ASSESSMENT OF INJURY TO WATERBIRDS FROM EVOS, EFFECTS ON POPULATION & BREEDING SUCCESS OF PIGEON GUILLEMOTS IN PWS # ATTACHING DETAILED STUDY PLAN
BD009	INTERIM RPT	OS01	1989	30439392	30439419	900112	OAKLEY, KAREN	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOS - EFFECTS ON THE POPULATION &

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								REPRODUCTIVE SUCCESS OF PIGEON GUILLEMOTS IN PWS
BD009	FINAL RPT	OS01	1990	30060288	30060358	900500	OAKLEY, KAREN L	ASSESSMENT OF INJURY TO WATERBIRDS FROM THE EVOS - EFFECTS ON THE POPULATION & REPRODUCTIVE SUCCESS OF PIGEON GUILLEMOTS IN PWS
BD009	INTERIM RPT	OS01	1991	30439776	30439779	911125	KULETZ, KATHY;USFWS	A PRELIMINARY SUMMARY OF THE EXXON VALDEZ DAMAGE ASSESSMENT STUDIES ON THE PIGEON GUILLEMOT # NOT A FULL RPT
BD009	INTERIM RPT	OS01	1991	30440160	30440164	911125	KULETZ, KATHY;USFWS	A PRELIMINARY SUMMARY OF THE EXXON VALDEZ DAMAGE ASSESSMENT STUDIES ON THE PIGEON GUILLEMOT # REVISED 920512 - NOT A FULL RPT
BD010	DETAIL PLAN	OS01	1989	5982903	5982913	891020	PATTEN, SAMUEL M;ADFG	STATE / FED NRDA DETAILED STUDY PLAN, APR 1989 - FED 1990 # ASSESSMENT OF INJURY TO GLAUCOUS - WINGED GULLS USING PWS - BIRD STUDY NO 10
BD010	INTERIM RPT	OS01	1989	30440544	30440562	900112	PATTEN, SAMUEL M;ADFG	ASSESSMENT OF INJURY TO GLAUCOUS-WINGED GULLS USING PWS
BD011	DETAIL PLAN	OS03	1989	9148008	9148019	891027	PATTEN, SAMUEL M;CALKINS, DONALD G	INJURY ASSESSMENT OF HYDROCARBON UPTAKE BY SEA DUCKS IN PWS & THE KODIAK ARCHIPELAGO # ATTACHING DETAILED STUDY PLAN
BD011	INTERIM RPT	OS01	1989	30440928	30440933	900112	PATTEN, SAMUEL M;ADFG	INJURY ASSESSMENT OF HYDROCARBON UPTAKE BY SEA DUCKS IN PWS & THE KODIAK ARCHIPELAGO
BD011	DETAIL PLAN	OS05	1990	5965091	5965104	900328	ADFG; ORGA FINANCIAL OFFICER; ORGA LEADER; PATTEN, SAMUEL M; PRINCIPAL INVESTIGATOR;	INJURY ASSESSMENT OF HYDROCARBON UPTAKE BY SEA DUCKS IN PWS # BIRD STUDY NO 11

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							USFWS	
BD011	INTERIM RPT	OS01	1990	30441312	30441346	901128	PATTEN, SAMUEL M;ADFG	INJURY ASSESSMENT OF HYDROCARBON UPTAKE BY SEA DUCKS IN PWS & THE KODIAK ARCHIPELAGO, AK # DRAFT PRELIMINARY NRDA STATUS RPT
BD011	DETAIL PLAN	OS03	1991	9291341	9291353	910128	PATTEN, SAMUEL M;ADFG	INJURY ASSESSMENT OF HYDROCARBON UPTAKE BY SEA DUCKS IN PWS # BIRD STUDY NO 11
BD011	INTERIM RPT	OS01	1991	30441696	30441908	911120	PATTEN, SAMUEL M;ADFG	INJURY ASSESSMENT OF HYDROCARBON UPTAKE BY SEA DUCKS IN PWS & THE KODIAK ARCHIPELAGO, AK # DRAFT PRELIMINARY NRDA STATUS RPT
BD012	DETAIL PLAN	OS01	1989	9148020	9148031	890300	MARTIN, PHILLIP;SHARP, BRIAN;WOHL, KENTON D; LEEDY, ROBERT R;BOWDEN, DAVID C	ASSESSMENT OF INJURY TO SHOREBIRDS STAGING & NESTING IN ROCKY INTERTIDAL HABITATS OF PWS # ATTACHING DETAILED STUDY PLAN
BD012	INTERIM RPT	OS01	1989	30442080	30442125	900112	SHARP, BRIAN	BLACK OYSTERCATCHERS IN PWS - OIL SPILL EFFECTS ON REPRODUCTION & BEHAVIOR IN 1989
BD012	INTERIM RPT	OS01	1989	30442464	30442518	900112	MARTIN, PHIL	ASSESSMENT OF INJURY TO SHOREBIRD STAGING & NESTING IN ROCKY INTERTIDAL HABITATS OF PWS - PART A - SPRING MIGRANTS
CH001	DETAIL PLAN	OS01	1989	30416335	30416341	890300	USFS;KARINEN, JOHN;RICE, STANLEY;SNYDER, GEORGE	PRE-SPILL & POST-SPILL CONCENTRATIONS OF HYDROCARBONS IN SEDIMENTS & MUSSELS AT INTERTIDAL SITES WITHIN PWS & THE GULF OF AK # DATES OF STUDY PLAN - MAR 26, 1989 - DCM 1991
CH001	DETAIL PLAN	OS02	1989	30090465	30090495	890929	SUNDBERG, KIMBAL A;RUE, FRANK;ADFG;USFS;EPA;	COASTAL HABITAT INJURY ASSESSMENT - PHASE I #

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							USDOI;NOAA;DEC;DNR	COASTAL HABITAT STUDY NO 1
CH001	DETAIL PLAN	OS01	1989	30416289	30416334	891100	HIGHSMITH, RAYMOND C; SCHIMEL, JOSHUA;BARBER, WILLARD E;JEWETT, STEPHEN;UAF	COMPREHENSIVE ASSESSMENT OF INJURY TO COASTAL HABITATS - PHASE II - STUDY PLAN NOV 1989
CH001	FINAL RPT	OS02	1989	30447936	30448019	891202	GIBEAUT, JIM;E-TECH	COASTAL HABITAT INJURY ASSESSMENT PWS - FINA # COASTAL HABITAT STUDY NO 1 (CH001A)
CH001	FINAL RPT	OS02	1989	30422162	30422227	891215	GIBEAUT, JIM;E-TECH	COASTAL HABITAT INJURY ASSESSMENT COOK INLET - KENAI AREA - FINAL RPT # COASTAL HABITAT STUDY NO 1 (CH001A)
CH001	FINAL RPT	OS02	1989	30422228	30422325	891215	SEXTON, JERRY;E-TECH	COASTAL HABITAT INJURY ASSESSMENT KODIAK - AK PENINSULA - FINAL RPT # COASTAL HABITAT STUDY NO 1 (CH001A)
CH001	DETAIL PLAN	OS01	1990	30424035	30424127	900300	HIGHSMITH, RAYMOND C; SCHIMEL, JOSHUA;BARBER, WILLARD;JEWETT, STEPHEN	COMPREHENSIVE ASSESSMENT OF INJURY TO COASTAL HABITATS - PHASE II - STANDARD OPERATING PROCEDURES MAR 1990
CH001	DETAIL PLAN	OS05	1990	5212839	5212847	900312	BABCOCK, MALIN M; KARINEN, JOHN F; NMFS; RATHBONE, DEBORAH; RICE, STANLEY D; SNYDER, GEORGE; USFS	PRE SPILL & POST SPILL CONCENTRATIONS OF HYDROCARBONS IN SEDIMENTS & MUSSELS AT INTERTIDAL SITES WITHIN PWS & THE GULF OF AK # COASTAL HABITAT STUDY NO 1
CH001	DETAIL PLAN	OS03	1990	30449463	30449471	000000	KARINEN, JOHN F;BABCOCK, MALIN M;NOAA;NMFS	PRE-SPILL & POST-SPILL CONCENTRATIONS OF HYDROCARBONS IN SEDIMENTS & MUSSELS AT INTERTIDAL SITES WITHIN PWS & THE GULF OF AK # COASTAL HABITAT STUDY NO 1 - DETAILED STUDY PLAN
CH001	DETAIL PLAN	OS05	1990	5965809	5965818	900316	SUNDBERG, KIMBAL A;RUE,	COASTAL HABITAT INJURY

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							FRANK;ADFGHD;USFS;USDOI; NOAA;DEC;DNR;UNI OF AK; UNI OF WY	ASSESSMENT - PHASE I # COASTAL HABITAT STUDY NO 1
CH001	INTERIM RPT	OS03	1989	30449472	30449482	900111	KARINEN, JOHNF;BABCOCK, MALIN M;NMFS;USFS;NOAA	STATE / FED NRDA PRELIMINARY STATUS RPT - PRE-SPILL & POST-SPILL CONCENTRATIONS OF HYDROCARBONS IN SEDIMENTS & MUSSELS AT INTERTIDAL SITES WITHIN PWS & THE GULF OF AK # COASTAL HABITAT STUDY NO 1
CH001	INTERIM RPT	OS02	1989	30448020	30448035	900112	ADFG;USFS;EPA;USDOI;NOAA; DEC;DNR;UAF	STATE / FED NRDA PRELIMINARY STATUS RPT DRAFT - COASTAL HABITAT INJURY ASSESSMENT - PHASE I # COASTAL HABITAT STUDY NO 1
CH001	INTERIM RPT	OS02	1990	30090734	30090743	901100	KARINEN, JOHN F;BABCOCK, MALIN M;NOAA	STATE / FED NRDA DRAFT STATUS RPT - PRE-SPILL & POST-SPILL CONCENTRATIONS OF HYDROCARBONS IN SEDIMENTS & MUSSELS AT INTERTIDAL SITES WITHIN PWS & THE GULF OF AK # COASTAL HABITAT STUDY NO 1
CH001	INTERIM RPT	OS01	1990	30025647	30026012	901100	HIGHSMITH, RAYMOND C; STEKOLL, MICHAEL;BARBER, WILLARD E;UAF	COASTAL HABITAT STUDY NO 1 - PHASE I & PHASE II - DRAFT PRELIMINARY STATUS RPT NOV 1990
CH001	INTERIM RPT	OS02	1990	30448036	30448064	901128	ADFG;USFS;USDOI;NOAA;DEC; DNR;UAF	DRAFT PRELIMINARY NRDA STATUS RPT - SITE SELECTION - PHASE I # COASTAL HABITAT STUDY NO 1
CH001	FINAL RPT	OS02	1990	30138618	30138697	900000		COASTAL HABITAT INJURY ASSESSMENT - 1990 SUPRATIDAL STUDY - FINAL RPT # COASTAL HABITAT STUDY NO 1
CH001	FINAL RPT	OS02	1990	30439614	30439649	901121	BORSTAD, GARY;KERR, RANDY;HILL, DAVE	STUDY TO DETERMINE THE ABILITY OF THE BORSTAD

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								ASSOC COMPACT AIRBORNE SPECTROGRAPHIC IMAGER (CASI) TO DETECT INJURIES TO FUCUS - FINAL RPT # COASTAL HABITAT STUDY NO 1
CH001	DETAIL PLAN	OS03	1991	30449340	30449346	910131	KARINEN, JOHN F;BABCOCK, MALIN M;NOAA;NMFS	PRE-SPILL & POST-SPILL CONCENTRATIONS OF HYDROCARBONS IN SEDIMENTS & MUSSELS AT INTERTIDAL SITES WITHIN PWS & THE GULF OF AK # INTERTIDAL BASELINE STUDY - COASTAL HABITAT STUDY NO 1
CH001	INTERIM RPT	OS01	1991	30041184	30041936	911100	HIGHSMITH, RAYMOND C;UAF; STEKOLL, MICHAEL;BARBER, WILLARD E	COASTAL HABITAT STUDY NO 1 - PHASE II - DRAFT PRELIMINARY STATUSRPT NOV 1991
CH001	INTERIM RPT	OS01	1991	30002265	30002285	910000	BABCOCK, MALIN;KARINEN, JOHN	STATUS RPT 1991 PRE-SPILL & POST-SPILL CONCENTRATIONS OF HYDROCARBONS IN SEDIMENTS & MUSSELS AT INTERTIDAL SITES WITHIN PWS & GULF OF AK - COASTAL HABITAT INTERTIDAL NO 1B & RECOVERY OF MONITORING STUDY NO 1 # CH001B
CH001	PRE PEER RPT	OS01	1991	30002286	30002331	910000		COASTAL HABITAT INJURY ASSESSMENT 1990 SUPRATIDAL STUDY FINAL RPT 1991
CH001	FINAL RPT	OS02	1991	30440165	30440371	911126	UAF	THE EFFECTS OF THE EVOS ON SHALLOW SUBTIDAL COMMUNITIES IN PWS # COASTAL HABITAT STUDY NO 1
CH001	DETAIL PLAN	OS01	1992	30424032	30424034	920000	HIGHSMITH, RAYMOND C; STEKOLL, MICHAEL;BARBER, WILLARD E;UAF	COASTAL HABITAT STUDY NO 1 - 1992 STUDY PLAN - COMPREHENSIVE ASSESSMENT OF INJURY TO COASTAL HABITATS
FS001	DETAIL PLAN	OS01	1989	152872	152877	891011	ADFGDCF;SHARR, SAM	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO SALMON SPAWNING AREAS IN

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								PWS # FISH / SHELLFISH STUDY NO 1
FS001	INTERIM RPT	OS05	1989	5212974	5212998	900113	SHARR, SAMUEL;MOFFITT, STEVE;BUE, BRIAN;WILCOCK, JOHN;ADFGDCF;DCR;NPS; USFS;USFWS	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO SALMON SPAWNING AREAS IN PWS # FISH / SHELLFISH STUDY NO 1
FS001	DETAIL PLAN	OS01	1990	644127	644135	900226	ADFGDCF; BUE, BRIAN; FLOREY, KR; FRIED, STEPHEN M; MEARBORN, C; OSIAR; SHARR, SAM	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO SALMON SPAWNING AREAS IN PWS
FS001	INTERIM RPT	OS02	1990	30136479	30136547	901120	SHARR, SAMUEL;SHARP, DAN; BUE, BRIAN;SADDLER, PENNY;ROSEN, TODD; ADFGDCF;NPS;USFS;USFWS; DNR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO SALMON SPAWNING AREAS IN PWS (NRDA) & ADULT ESCAPEMENT ENUMERATION (RESTORATION) # FISH / SHELLFISH STUDY NO 1 & RESTORATION STUDY NO 9
FS001	INTERIM RPT	OS02	1990	30091113	30091163	901125	SHARR, SAMUEL;BUE, BRIAN; HAUSLER, MARY;JOHNSON, MARIANNE;MOFFITT, STEVE; SADDLER, PENNY;NPS;USFS; USFWS;DNR;ADFGDCF	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO SALMON SPAWNING AREAS IN PWS # FISH / SHELLFISH STUDY NO 1
FS002	DETAIL PLAN	OS01	1989	152878	152889	891011	ADFG;SHARR, SAM	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO SALMON EGGS & PRE-EMERGENT FRY IN PWS # FISH / SHELLFISH STUDY NO 2
FS002	INTERIM RPT	OS05	1989	30449684	30449714	890113	SHARR, SAMUEL;BUE, BRIAN; MOFFITT, STEVE;ADFGDCF; USFS;DNR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO SALMON EGGS & PRE-EMERGENT FRY IN PWS # FISH / SHELLFISH STUDY NO 2
FS002	DETAIL PLAN	OS01	1990	8932587	8932594	900226	ADFGDCF; BUE, BRIAN; DNR; FRIED, STEPHEN M; MEACHAM, CHARLES; OSIAR; OSIAR DIR; REGIONAL SUPERVISOR; SHARR, SAM;	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO SALMON EGGS & PRE-EMERGENT FRY IN PWS # FISH / SHELLFISH STUDY NO 2

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							USFS	
FS002	INTERIM RPT	OS02	1990	30091164	30091225	901121	SHARR, SAMUEL;BUE, BRIAN; MOFFITT, STEVE;USFS;DNR; ADFGDCF	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO SALMON EGGS & PREEMERGENT FRY IN PWS # FISH / SHELLFISH STUDY NO 2
FS002	INTERIM RPT	OS02	1991	30136549	30136638	911120	SHARR, SAMUEL;BUE, BRIAN; MOFFETT, STEVE;USFS;DNR; ADFGDCF	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO SALMON EGGS & PREEMERGENT FRY IN PWS # FISH / SHELLFISH STUDY NO 2
FS003	DETAIL PLAN	OS03	1989	5576792	5576803	891013	ADFG; ADFGDCF; BIOMETRICIAN; CONSULTING BIOMETRICIAN; DIR; FRED; NOAA; OSIAR; PELTZ, LARRY; PROGRAM MANAGER; SHARR, SAM; SUPERVISOR; UNI OF AK	STATE FED NRDA DETAILED STUDY PLAN CODE-WIRE TAG STUDIES ON PWS SALMON # FISH SHELLFISH STUDY NO 3
FS003	DETAIL PLAN	OS01	1990	644144	644157	900226	ADFGDCF; FRED; BUE, BRIAN;FLOREY, KR; FRIED, STEPHEN M; MEARBORN, C; OSIAR; PELTZ, LARRY; SHARR, SAM	STATE / FED NRDA DETAILED STUDY PLAN - SALMON CODED-WIRE TAG STUDIES IN PWS # FISH / SHELLFISH STUDY NO 3
FS003	INTERIM RPT	OS02	1989	30089549	30089567	900113	SHARR, SAMUEL;PELTZ, LARRY;JOHNSON, MARIANNE; GEIGER, HAL;CRANDALL, KAREN;PAGE, TIM;BUE, BRIAN;ADFG;NOAA;DNR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - CODED-WIRE TAG STUDIES ON PWS SALMON # FISH / SHELLFISH STUDY NO 3
FS003	INTERIM RPT	OS02	1990	30091226	30091246	901128	SHARR, SAMUEL;PELTZ, LARRY;JOHNSON, MARIANNE; BUE, BRIAN;SMITH, JODI; SHARP, DAN;ADFG;NOAA;DNR; UNI OF AK	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - CODED-WIRE TAG STUDIES ON PWS SALMON # FISH / SHELLFISH STUDY NO 3
FS003	INTERIM RPT	OS02	1991	30136640	30136673	911120	SHARR, SAMUEL;WILLETTE, MARK;PECKHAM, CAROL; SHARP, DAN;SMITH, JODI; ADFGDCF;NOAA;UNI OF AK; DNR;FRED	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - CODED-WIRE TAG STUDIES ON PWS SALMON # FISH / SHELLFISH STUDY NO 3 & RESTORATION STUDY NO 8

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
FS004	DETAIL PLAN	OS01	1989	152890	152925	891011	ADFG;FRED;RAYMOND, JIM	STATE / FED NRDA DETAILED STUDY PLAN - EARLY MARINE SALMON INJURY ASSESSMENT IN PWS # FISH / SHELLFISH STUDY NO 4
FS004	INTERIM RPT	OS03	1989	30449451	30449462	900111	WERTHEIMER, ALEX;NOAA; ADFG;UAF	STATE / FED NRDA PRELIMINARY STATUS RPT - IMPACT OF OIL SPILL ON JUVENILE PINK & CHUM SALMON & THEIR PREY IN CRITICAL NEARSHORE HABITATS # FISHERIES STUDY NO 4
FS004	INTERIM RPT	OS05	1989	30019465	30019505	900112	RAYMOND, JIM;ADFG;FRED; WERTHEIMER, ALEX;NMFS; COONEY, R TED;UNI OF AK, IMS	DRAFT PRELIMINARY STATUS RPT - EARLY MARINE SALMON INJURY ASSESSMENT IN PWS # FISH / SHELLFISH STUDY NO 4
FS004	DETAIL PLAN	OS03	1990	644099	644126	900306	FRED; RAYMOND, JIM; WERTHEIMER, ALEX C	STATE FED NRDA DETAILED DETAILED STUDY PLAN EARLY MARINE SALMON INJURY ASSESSMENT IN PWS
FS004	DETAIL PLAN	OS01	1990	526190	526213	900312	ADFG; CARLS, MARK; CELEWYCZ, ADRIAN; NMFS; NOAA; RATHBONE, DEBORAH; RICE, STANLEY D; SNYDER, GEORGE; WERTHEIMER, ALEX	STATE / FED NRDA DETAILED STUDY PLAN - 1990 IMPACT OF OIL SPILL ON JUVENILE PINK & CHUM SALMON & THEIR PREY IN CRITICAL NEAR SHORE HABITATS # FISHERIES STUDY NUMBER 4
FS004	INTERIM RPT	OS02	1990	30091247	30091348	900000	WERTHEIMER, ALEX; CELEWYCZ, ADRIAN;CARLS, MARK;NOAA	NRDA DRAFT STATUS RPT 1990 - IMPACT OF OIL SPILL ON JUVENILE PINK & CHUM SALMON & THEIR PREY IN CRITICAL NEARSHORE HABITATS # FISHERIES STUDY NO 4
FS004	INTERIM RPT	OS02	1990	30091349	30091373	901128	RAYMOND, JIM;WERTHEIMER, ALEX;COONEY, R TED;ADFG; NMFS;UNI OF AK	DRAFT PRELIMINARY STATUS RPT - EARLY MARINE SALMON INJURY ASSESSMENT IN PWS # FISH / SHELLFISH STUDY NO 4
FS004	DETAIL PLAN	OS03	1991	30449438	30449450	910205	WERTHEIMER, ALEX;CARLS,	STATE / FED NRDA DETAILED

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							MARK;CELEWYCZ, ADRIAN; RICE, STANLEY;RATHBONE, DEBI;NOAA;NMFS;ADFG	STUDY PLAN - EARLY MARINE SALMON INJURY ASSESSMENT IN PWS # FISH / SHELLFISH STUDY NO 4
FS004	DETAIL PLAN	OS01	1991	9136492	9136505	910208	ADFG;FRED;WILLETTE, MARK; NMFS;WERTHEIMER, ALEX	STATE / FED NRDA DETAILED STUDY PLAN - EARLY MARINE SALMON INJURY ASSESSMENT IN PWS # FISH / SHELLFISH STUDY NUMBER 4A, (FS004A), LEAD AGENCIES ARE STATE OF AK, ADFG, FRED DIV, FED, NMFS, AUKE BAY LAB
FS004	INTERIM RPT	OS02	1991	30136723	30136941	910000	WERTHEIMER, ALEX; CELEWYCZ, ADRIAN;CARLS, MARK;STURDEVANT, MOLLY; NMFS	NRDA DRAFT STATUS RPT 1991 - IMPACT OF OIL SPILL ON JUVENILE PINK & CHUM SALMON & THEIR PREY IN CRITICAL NEARSHORE HABITATS # FISHERIES STUDY NO 4
FS004	INTERIM RPT	OS02	1991	30136675	30136722	911120	WILLETTE, MARK; WERTHEIMER, ALEX;ADFG; FRED;NMFS	STATE / FED NRDA DRAFT STATUS RPT - EARLY MARINE SALMON INJURY ASSESSMENT IN PWS # FISH / SHELLFISH STUDY NO 4
FS004	INTERIM RPT	OS02	1991	30033756	30034022	911120	WILLETTE, MARK; WERTHEIMER, ALEX;ADFG; FRED;NMFS	STATE / FED NRDA DRAFT STATUS RPT - EARLY MARINE SALMON INJURY ASSESSMENT IN PWS # FISH / SHELLFISH STUDY NO 4B (FS004B)
FS005	DETAIL PLAN	OS03	1989	30439699	30439718	890925	HEPLER, KELLY;HOFFMANN, ANDREW;BROOKOVER, TOM; ADFGDSF;USFS;DNR	STATE / FED RESOURCE DAMAGE ASSESSMENT DETAILED STUDY PLAN - INJURY TO DOLLY VARDEN, CHAR, & CUTTHROAT TROUT IN PWS # FISH / SHELLFISH STUDY NO 5
FS005	INTERIM RPT	OS03	1989	333610	333667	891229	ADFGDSF; HEPLER, KELLY	STATE FED NRDA DATA SUMMARY RPT INJURY DOLLY VARDEN CHAR & CUTTHROAT TROUT IN PWS # FISH - SHELLFISH STUDY NO 5

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
FS005	DETAIL PLAN	OS03	1990	644158	644175	900200	ADFGDSF; HANSEN, PAT; HEPLER, KELLY; KRANOWSKI, PAUL; MCBRIDE, DOUG	STATE FED NRDA DETAILED STUDY PLAN INJURY TO DOLLY VARDEN CHAR & CUTTHROAT TROUT IN PWS # FISH SHELLFISH STUDY NO 5
FS005	INTERIM RPT	OS02	1990	30091522	30091573	901128	HEPLER, KELLY;HOFFMANN, ANDREW;HANSEN, PAT; ADFGDSF	DRAFT PRELIMINARY STATUS RPT - INJURY TO DOLLY VARDEN CHAR & CUTTHROAT TROUT IN PWS # FISH / SHELLFISH STUDY NO 5
FS005	INTERIM RPT	OS02	1991	30136943	30136986	911120	HEPLER, KELLY;HOFFMANN, ANDREW;HANSEN, PAT; ADFGDSF	STATE / FED RESOURCE DAMAGE ASSESSMENT DATA SUMMARY RPT - INJURY TO DOLLY VARDEN & CUTTHROAT TROUT IN PWS # FISH / SHELLFISH STUDY NO 5
FS005	FINAL RPT	OS10	1989	30287060	30287098	930622	HEPLER, KELLY R;HANSEN, PATRICIA A;OSIAR;BERNARD, DAVID R;ADFGDSF	IMPACT OF OIL SPILLED FROM THE EXXON VALDEZ ON SURVIVAL & GROWTH OF DOLLY VARDEN & CUTTHROAT TROUT IN PWS AK # FINAL RPT
FS006	DETAIL PLAN	OS03	1989	372505	372569	891013	WHITMORE, CRAIG;ADFG; ROTH, KENT;HOLMES, ROLLAND	STATE / FED NRDA DETAILED STUDY PLAN, PWS & GULF OF AK SPORT FISHERY HARVEST & EFFORT # NRDA FISH / SHELLFISH STUDY NO 6
FS006	FINAL RPT	OS02	1990	30089670	30089794	900306	ROTH, KENT;WHITMORE, CRAIG;HANSEN, PAT;ADFGDSF	STATE / FED RESOURCE DAMAGE ASSESSMENT FINAL DATA SUMMARY RPT - PWS & GULF OF AK SPORT FISHERY HARVEST & EFFORT, 1989 # FISH / SHELLFISH STUDY NO 6
FS007	DETAIL PLAN	OS01	1989	9419375	9419391	891009	ADFGDCF; DIR; OSIAR; PROGRAM MANAGER; SENIOR BIOMETRICIAN; SUPERVISOR; SWANTON, CHARLES; USFWS; YUEN, HENRY	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PINK / CHUM SALMON SPAWNING AREAS OUTSIDE PRINCE WILLIAM SOUND # FISH SHELLFISH STUDY NO 7
FS007	DETAIL PLAN	OS01	1990	6547627	6547633	900403	YUEN, HENRY;MORRISON, RANCE;BUE, BRIAN;ADFG;	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PINK

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							DNR;USFS;USFWS	/ CHUM SALMON SPAWNING AREAS OUTSIDE PWS (LOWER COOK INLET / KENAI FJORDS) # FISH / SHELLFISH STUDY NO 7
FS007	DETAIL PLAN	OS01	1990	644176	644193	900223	ADFGDCF; FLOREY, KR; FRIED, STEPHEN M; YUEN, HENRY	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PINK CHUM SALMON SPAWNING AREAS OUTSIDE PWS (LOWER COOK INLET KENAI FJORDS) # FISH / SHELLFISH STUDY NO 7A (FS007A)
FS007	DETAIL PLAN	OS01	1990	644194	644206	900305	ADFG; JOHNSON, B ALAN; NICHOLSON, LARRY D; SWANTON, CHARLES	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PINK SALMON SPAWNING AREAS WITHIN THE KODIAK & CHIGNIK MANAGEMENT UNITS # FISH / SHELLFISH STUDY NO 7B (FS007B)
FS007	INTERIM RPT	OS02	1989	30089795	30089858	900112	YUEN, HENRY;SWANTON, CHARLES;BUE, BRIAN; MORRISON, RANCE;FOX, JEFF;BRENNAN, KEVIN; ADFGDCF;NPS;USFS;USFWS; DNR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO PINK & CHUM SALMON SPAWNING AREAS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 7
FS007	INTERIM RPT	OS02	1990	30091574	30091611	901128	YUEN, HENRY;BUE, BRIAN; BECHTOL, BILL;MORRISON, RANCE;FOX, JEFF;BRENNAN; ADFGDCF;NPS;USFS;USFWS; DNR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO PINK & CHUM SALMON SPAWNING AREAS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 7A (FS007A)
FS007	INTERIM RPT	OS02	1990	30091612	30091629	901130	SWANTON, CHARLES;BARRETT, BRUCE;USFWS;ADFG;OSIAR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO PINK SALMON SPAWNING AREAS WITHIN THE KODIAK & CHIGNIK MANAGEMENT UNITS # FISH / SHELLFISH STUDY NO 7B (FS007B)
FS007	INTERIM RPT	OS02	1991	30136988	30137040	911122	YUEN, HENRY;SWANTON,	STATE / FED NRDA DRAFT

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							CHARLES;BUE, BRIAN; BECHTOL, BILL;MORRISON, RANCE;FOX, JEFF;BRENNAN, KEVIN;ADFGDCF;NPS;USFS; USFWS;DNR	PRELIMINARY STATUS RPT - INJURY TO PINK, CHUM SALMON SPAWNING AREAS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 7A (FS007A)
FS008	DETAIL PLAN	OS01	1989	9419392	9419404	891009	ADFGDCF; DIR; OSIAR; PROGRAM MANAGER; SENIOR BIOMETRICIAN; SUPERVISOR; SWANTON, CHARLES; USFWS; YUEN, HENRY	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PINK & CHUM SALMON EGG & PRE-EMERGENT FRY OUTSIDE PWS # FISH SHELLFISH STUDY NO 8
FS008	DETAIL PLAN	OS01	1990	644207	644216	900223	ADFGDCF; BUE, BRIAN; FLOREY, KR; FRIED, STEPHEN M; YUEN, HENRY	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PINK & CHUM SALMON EGGS & PREEMERGENT FRY OUTSIDE PWS (LOWER COOK INLET KENAI FIORDS) # FISH SHELLFISH STUDY NO 8A (FS008A)
FS008	DETAIL PLAN	OS01	1990	644217	644227	900305	ADFG;OSIAR;JOHNSON, B ALAN; NICHOLSON, LARRY D; SWANTON, CHARLES	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PINK SALMON EGG & PREEMERGENT FRY IN THE KODIAK & CHIGNIK MANAGEMENT AREAS # FISH SHELLFISH STUDY NO 8B (FS008B)
FS008	INTERIM RPT	OS02	1990	30091658	30091670	000000	SWANTON, CHARLES;DALTON, TIM;ADFG;USFWS	STATE / FED NRDA PRELIMINARY STATUS RPT - INJURY TO PINK SALMON EGG & PREEMERGENT FRY IN THE KODIAK & CHIGNIK MANAGEMENT UNITS # FISH / SHELLFISH STUDY NO 8B (FS008B)
FS008	INTERIM RPT	OS02	1989	30089859	30089909	900112	YUEN, HENRY;SWANTON, CHARLES;BUE, BRIAN; MORRISON, RANCE;FOX, JEFF;BRENNAN, KEVIN; ADFGDCF;NPS;USFS;USFWS; DNR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO PINK & CHUM SALMON EGG & PREEMERGENT FRY IN AREAS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 8
FS008	INTERIM RPT	OS02	1990	30091630	30091657	901128	YUEN, HENRY;BUE, BRIAN; MORRISON, RANCE;BECHTOL,	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT -

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							BILL;ADFGDCF;NPS;USFS; USFWS;DNR	INJURY TO PINK & CHUM SALMON EGG & PREEMERGENT FRY IN AREAS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 8A (FS008A)
FS009	DETAIL PLAN	OS01	1989	152926	152933	891011	ADFG;FRED;RAYMOND, JIM	STATE / FED NRDA DETAILED STUDY PLAN - EARLY MARINE SALMON INJURY ASSESSEMENT FOR THE KENAI PENINSULA & KODIAK / SHELIKOF STRAIT # STUDY NO 9
FS009	INTERIM RPT	OS05	1989	5576292	5576295	000000		OSIAR PRELIMINARY STATUS RPT - EARLY MARINE SALMON INJURY ASSESSMENT FOR THE KENAI PENINSULA & KODIAK / SHELIKOF STRAIT (KENAI PENINSULA SEGMENT) # FISH / SHELLFISH STUDY NO9
FS010	DETAIL PLAN	OS01	1989	5577309	5577384	890925	ADFGDSF; DIR; DNR; DUDIAK, NICHOLAS; HEPLER, KELLY; HOLMES, ROLLAND; OSIAR; PRINCIPAL INVESTIGATOR; SENIOR BIOMETRICIAN; SUPERVISOR; USFS; XXDOUG	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO DOLLY VARDEN CHAR & SOCKEYE SALMON IN THE LOWER KENAI PENINSULA # FISH SHELLFISH STUDY NO 10
FS011	DETAIL PLAN	OS01	1989	152934	152986	891005	ADFGDCF;BIGGS, EVELYN	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PWS HERRING # STUDY NO 11
FS011	DETAIL PLAN	OS01	1990	644228	644320	900302	ADFGDCF; BAKER, TIMOTHY T; BIGGS, EVELYN D; FLOREY, KR; FRIED, STEPHEN M	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PWS HERRING # FISH SHELLFISH STUDY NO 11
FS011	INTERIM RPT	OS02	1990	30089914	30090000	900112	BIGGS, EVELYN;FUNK, FRITZ;BAKER, TIM;MCGURK, MIKE;ADFGDCF;NOAA;USFS; DNR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO PWS HERRING # FISH / SHELLFISH STUDY NO 11
FS011	INTERIM RPT	OS02	1990	30091671	30091837	901128	BIGGS, EVELYN;BAKER, TIM; FUNK, FRITZ;MCGURK, MIKE; HOSE, JOELLEN;ADFGDCF;	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO PWS HERRING #

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							NOAA;USFS;DNR	FISH / SHELLFISH STUDY NO 11
FS011	INTERIM RPT	OS02	1991	30137044	30137170	911127	BIGGS, EVELYN;BAKER, TIM; MCGURK, MICHAEL;HOSE, JOELLEN;KOCAN, RICHARD; ADFGDCF;NOAA;USFWS;DNR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO PWS HERRING # FISH / SHELLFISH STUDY NO 11
FS012	DETAIL PLAN	OS01	1989	152987	153001	891006	ADFGDCF;BRENNAN, KEVIN	STATE / FED NRDA DETAILED STUDY PLAN - HYDROCARBON INJURY ASSESSMENT - KODIAK & AK PENINSULA HERRING # STUDY NO 12
FS012	INTERIM RPT	OS02	1989	30090001	30090077	900112	BRENNAN, KEVIN;GRETCH, DENNIS;RUDGE, KIM;ADFGDCF	STATE / FED NRDA PRELIMINARY STATUS RPT - HYDROCARBON INJURY ASSESSMENT - KODIAK & AK PENINSULA AREAS # FISH / SHELLFISH STUDY NO 12
FS013	DETAIL PLAN	OS01	1989	8255421	8255444	891012	ADFGDCF;DAVIS, ALAN S; H, JR; HILSINGER, JOHN R; OSIAR	STATE / FED NRDA DETAILED STUDY PLAN - EFFECTS OF HYDROCARBONS ON BIVALVES # FISH / SHELLFISH STUDY NO 13
FS013	INTERIM RPT	OS05	1989	30071727	30071760	900112	DONALDSON, WAYNE; TROWBRIDGE, CHARLES; DAVIS, AL;ACKLEY, DAVE; ADFG	PRELIMINARY STATUS RPT - INJURY TO PWS CLAMS & INJURY TO CLAMS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 13
FS013	DETAIL PLAN	OS01	1990	644321	644354	900316	ADFGDCF; DAVIS, ALLEN S; DONALDSON, WAYNE; FLOREY, KR; HILSINGER, JOHN	STATE / FED NRDA DETAILED STUDY PLAN - EFFECTS OF HYDROCARBONS ON BIVALVES # FISH SHELLFISH STUDY NO 13
FS013	INTERIM RPT	OS02	1990	30091838	30091899	901203	DAVIS, ALAN S;DONALDSON, WAYNE;ACKLEY, DAVE; TROWBRIDGE, CHARLES; URBAN, DAN;USFS;ADFGDCF; DNR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - EFFECTS OF HYDROCARBONS ON BIVALVES # FISH / SHELLFISH STUDY NO 13
FS013	DETAIL PLAN	OS01	1991	7981256	7981287	910204	ADFGDCF;TROWBRIDGE, CHARLES	STATE / FED NRDA DETAILED STUDY PLAN - EFFECTS OF HYDROCARBONS ON BIVALVES # ATTACHMENT DOCUMENTS

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								VARIOUS TITLES & SUBJECTS
FS013	INTERIM RPT	OS02	1991	30137172	30137206	911127	TROWBRIDGE, CHARLES; JOHNSON, JD;BAKER, TIM; ADFGDCF;USFS;DNR	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - EFFECTS OF HYDROCARBONS ON BIVALVES # FISH / SHELLFISH STUDY NO 13
FS014	DETAIL PLAN	OS01		8480585	8480589	000000	ADFGDCF; CONSULTING BIOMETRICIAN; DIRECTOR; DNR; DONALDSON, WAYNE; HILSINGER, JOHN; NOAA; OSIAR; PROGRAM MANAGER; SENIOR BIOMETRICIAN; SUPERVISOR; TROWBRIDGE, CHARLES; USFS	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PWS CRABS # UNSIGNED - FISH SHELLFISH STUDY NO 14
FS014	DETAIL PLAN	OS03	1989	30449422	30449437	891012	TROWBRIDGE, CHARLES; OCLAIR, CHARLES E; HILSINGER, JOHN; DONALDSON, WAYNE;FREESE, LINCOLN;SMITH, BRAD;NOAA; ADFGDCF;USFS;DNR	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PWS CRABS # FISH / SHELLFISH STUDY NO 14
FS014	INTERIM RPT	OS01	1989	464109	464147	890000		INJURY TO PWS CRABS # FISH / SHELLFISH STUDY NO 14
FS014	INTERIM RPT	OS03	1989	30449419	30449421	900116	OCLAIR, CHARLES E;NOAA; ADFG	STATE / FED NRDA PRELIMINARY STATUS RPT - INJURY TO PWS CRABS # FISH / SHELLFISH STUDY NO 14
FS015	DETAIL PLAN	OS03	1989	8262089	8262125	891012	ADFGDCF; DEAN, MICHAEL R; DONALDSON, WAYNE; HOLMS, ROLLAND; OSIAR; SENIOR BIOMETRICIAN; TROWBRIDGE, CHARLES	STATE FED NRDA DETAILED STUDY PLAN INJURY TO PWS SPOT SHRIMP # DRAFT - FISH SHELLFISH STUDY NUMBER 15
FS015	DETAIL PLAN	OS01	1990	644355	644391	900316	ADFGDCF; DONALDSON, WAYNE; FLOREY, KR; HILSINGER, JOHN	STATE / FED NDRA DETAILED STUDY PLAN - INJURY TO PWS SPOT SHRIMP # FISH SHELLFISH STUDY NO 15
FS015	INTERIM RPT	OS02	1989	30090118	30090166	900112	DONALDSON, WAYNE;ACKLEY, DAVE;ADFG	PRELIMINARY STATUS RPT - INJURY TO PWS SPOT SHRIMP # FISH / SHELLFISH STUDY NO 15

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
FS015	INTERIM RPT	OS02	1990	30091900	30092007	901201	DONALDSON, WAYNE;ACKLEY, DAVE;TROWBRIDGE, CHARLES; URBAN, DAN;KINZER, VERA; COYER, DAN;ADFGDCF	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO PWS SPOT SHRIMP # FISH / SHELLFISH STUDY NO 15
FS015	DETAIL PLAN	OS01	1991	8262175	8262219	910204	ADFGDCF; CONSULTING BIOMETRICIAN; DIRECTOR; DONALDSON, WAYNE; FRIED, STEPHEN M; OSIAR; PROGRAM MANAGER; REGIONAL SUPERVISOR	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO PWS SPOT SHRIMP # FISH SHELLFISH STUDY NO 15 - INCLUDES PROCEDURES, GEAR LISTS, HOW TO HANDLE SAMPLES & OTHER APPENDICES
FS016	DETAIL PLAN	OS01	1989	153002	153015	891011	ADFG	PWS OYSTERS # STUDY NO 16
FS016	INTERIM RPT	OS02	1989	30090167	30090181	900112	KAILL, MICHAEL;BABCOCK, MALIN M;ADFG;FRED;NMFS	STATE / FED NRDA PRELIMINARY STATUS RPT - PWS OYSTERS # FISH / SHELLFISH STUDY NO 16
FS017	DETAIL PLAN	OS03	1989	372936	372944	891009	HEPLER, KELLY;ADFG; MCBRIDE, DOUGLAS	STATE / FED NRDA DETAILED PLAN , INJURY TO ROCKFISH IN PWS # NRDA FISH / SHELLFISH STUDY NUMBER 17
FS017	DETAIL PLAN	OS01	1990	644392	644409	900226	ADFGDSF; HAUSEN, PATRICIA; HEPLER, KELLY	STATE / FED NDRA DETAILED STUDY PLAN - INJURY TO DEMERSAL ROCKFISH & SHALLOW REEF HABITATS IN PWS
FS017	INTERIM RPT	OS01	1989	333806	333842	900112	ADFGDSF; HEPLER, KELLY	STATE / FED RESOURCE DAMAGE ASSESSMENT DATA SUMMARY RPT INJURY TO ROCKFISH IN PWS # FISH SHELLFISH STUDY NO 17
FS017	INTERIM RPT	OS02	1990	30092008	30092029	901128	HEPLER, KELLY;HANSEN, PATRICIA;HOFFMAN, ANDREW; ADFG	STATE / FED RESOURCE DAMAGE ASSESSMENT DATA SUMMARY RPT - INJURY TO DEMERAL ROCKFISH & SHALLOW REEF HABITATS IN PWS & ALONG THE LOWER KENAI PENINSULA # FISH / SHELLFISH STUDY NO 17
FS018	DETAIL PLAN	OS05		5525491	5525516	890928	HAYNES, EVAN;NMFS;ADFG	FISHERIES & SHELLFISH STUDY NO 18

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
FS018	DETAIL PLAN	OS03	1989	30439719	30439729	891012	HAYNES, EVAN;URBAN, DAN; DONALDSON, WAYNE; BRANNIAN, LINDA;RUTECKI, TOM;HAIGHT, DICK;WING, BRUCE;KARINEN, JOHN; SIGLER, MIKE;HEIFETZ, JON;ADFGDCF;NMFS	STATE / FED NRDA DETAILED STUDY PLAN - PWS TRAWL ASSESSMENT # FISH / SHELLFISH STUDY NO 18
FS018	INTERIM RPT	OS03	1989	30449412	30449418	900111	HAYNES, EVAN;URBAN, DAN; NOAA;ADFGDCF;NMFS	STATE / FED NRDA PRELIMINARY STATUS RPT - PWS TRAWL ASSESSMENT # FISH / SHELLFISH STUDY NO 18
FS018	DETAIL PLAN	OS01	1990	526258	526261	900312	ADFG; HAYNES, EVAN; NMFS; NOAA; RATHBONE, DEBORAH; RICE, STANLEY D; SNYDER, GEORGE	STATE / FED NRDA DETAILED STUDY PLAN - 1990 PWS TRAWL ASSESSMENT # FISH SHELLFISH STUDY NO 18
FS018	INTERIM RPT	OS02	1990	30438305	30438375	901100	HAYNES, EVAN;NMFS; DONALDSON, WAYNE;ADFGDCF	STATE / FED NRDA DRAFT STATUS RPT - PWS TRAWL ASSESSMENT # BOTTOMFISH / SHELLFISH STUDY NO 18
FS018	FINAL RPT	OS02	1991	8668186	8668253	910200	ADFGDCF; HAYNES, EVAN; NMFS; URBAN, DAN	STATE FED NRDA FINAL RPT PWS TRAWL ASSESSMENT # FISH SHELLFISH STUDY NO 18
FS019	DETAIL PLAN	OS01	1989	8058420	8058448	890300	NORCROSS, BRENDA L; ALEXANDER, VERA; OSTERKAMP, JOAN	INJURY TO LARVAL FISH IN PWS # MAR 1989 - FEB 1990
FS019	INTERIM RPT	OS02	1989	30090235	30090259	900112	NORCROSS, BRENDA L;UAF	DRAFT PRELIMINARY STATUS RPT - INJURY TO LARVAL FISH IN PWS # FISH / SHELLFISH STUDY NO 19
FS020	DETAIL PLAN	OS03	1989	373114	373120	891018	HUTTUNEN, DAN;ADFG; SKVORC, PAUL;HOLMES, ROLLAND	STATE / FED NRDA DETAILED STUDY PLAN, UNDERSEA OBSERVATIONS OF SUBMERGED OIL # NRDA FISH / SHELLFISH STUDY NUMBER 20
FS020	INTERIM RPT	OS02	1989	30090260	30090288	890100	HUTTUNEN, DANIEL C; SKVORC, PAUL A;ADFG;OSIAR	STATE / FED NRDA DRAFT RPT - UNDERSEA OBSERVATIONS OF SUBMERGED OIL # FISH /

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								SHELLFISH STUDY NO 20
FS021	DETAIL PLAN	OS01	1989	8481377	8481401	891012	ADFGDCF; DAVIS, ALAN S; DIRECTOR; DNR; HILSINGER, JOHN R; NPS; OSIAR; PROGRAM MANAGER; SENIOR BIOMETRICIAN; USFS	STATE / FED NRDA DETAILED STUDY PLAN INJURY TO CLAMS OUTSIDE PWS # FISH SHELLFISH STUDY NO 21
FS021	INTERIM RPT	OS05	1989	30301824	30301857	900112	DONALDSON, WAYNE; TROWBRIDGE, CHARLES; DAVIS, AL;ACKLEY, DAVE; ADFG	PRELIMINARY STATUS RPT - INJURY TO PWS CLAMS & INJURY TO CLAMS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 21
FS022	DETAIL PLAN	OS03	1989	30449168	30449211	891013	OCLAIR, CHARLES E;FREESE, J LINCOLN;DONALDSON, WILLIAM;NMFS;ADFG	INJURY TO CRABS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 22
FS022	INTERIM RPT	OS02	1989	30090289	30090294	900112	OCLAIR, CHARLES E;FREESE, J LINCOLN;DONALDSON, WILLIAM;NMFS;ADFGDCF	STATE / FED NRDA PRELIMINARY STATUS RPT - INJURY TO CRABS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 22
FS022	DETAIL PLAN	OS03	1990	30449404	30449411	900312	OCLAIR, CHARLES E;FREESE, J LINCOLN;NOAA;ADFG	STATE / FED NRDA DETAILED STUDY PLAN 1990 - INJURY TO CRABS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 22
FS022	INTERIM RPT	OS02	1990	30092101	30092124	901100	FREESE, J LINCOLN;OCLAIR, CHARLES E;NMFS	NRDA DRAFT STATUS RPT - NOV 1990 - INJURY TO CRABS OUTSIDE PWS # FISH / SHELLFISH STUDY NO 22
FS023	DETAIL PLAN	OS03	1989	180450	180458	890925	ADFG;USFS;DNR	STATE - FED NRDA DETAILED STUDY PLAN, INJURY TO ROCKFISH, HALIBUT & LINGCOD ALONG THE LOWER KENAI PENINSULA
FS023	INTERIM RPT	OS01	1989	333879	333906	900117	ADFGDSF; HEPLER, KELLY	STATE / FED RESOURCE DAMAGE ASSESSMENT DATA SUMMARY RPT INJURY TO ROCKFISH HALIBUT & LINGCOD ALONG THE LOWER KENAI PENINSULA

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
FS024	DETAIL PLAN	OS01	1989	6201949	6201988	891012	ADFG; ADFGDCF; GERY, R; HILSINGER, JOHN R; KIMKER, AL;MOSER, GE; NICHOLSON, LARRY D; NIPPES, WILLIAM; NMFS; NMFS SUPERVISOR; NOAA; OSIAR DIRECTOR; OSIAR PROGRAM MANAGER; OSIAR SENIOR BIOMETRICIAN; STAUFFER, GARY; VARANASI, USHA	STATE / FED NRDA DETAILED STUDY PLAN - PROJECT TITLE: SHELLFISH & GROUNDFISH TRAWL ASSESSMENT OUTSIDE PWS
FS024	DETAIL PLAN	OS01	1990	526022	526045	900314	NOAA;VARANASI, USHA	EVOS FISHERIES IMPACT ASSESSMENT PROGRAMS ASSESSMENT OF OIL SPILL IMPACTS ON FISHERY RESOURCES: MEASUREMENT OF HYDROCARBONS & THEIR METABOLITES & THEIR EFFECTS IN IMPORTANT SPECIES
FS024	INTERIM RPT	OS02	1990	30092125	30092173	000000	VARANASI, USHA;CHAN, SIN-LAM;CLARK, ROBERT C; COLLIER, TRACY K; GRONLUND, WILLIAM D; HAGEN, JENNIFER L; JOHNSON, LYNDAL L;KRAHN, MARGARET M;LANDAHL, JOHN T;MYERS, MARK S;NMFS	OIL SPILL PROGRESS RPT - SHELLFISH & GROUNDFISH OUTSIDE PWS - ASSESSMENT OF OIL SPILL IMPACTS ON FISHERY RESOURCES - MEASUREMENT OF HYDROCARBONS & THEIR METABOLITES & THEIR EFFECTS IN IMPORTANT SPECIES # FISH / SHELLFISH STUDY NO 24
FS024	INTERIM RPT	OS01	1989	463906	463951	900100	ADFG; BROWN, ERIC; JACKSON, DAVID; KIMKER, AL; NMFS	SHELLFISH & GROUNDFISH TRAWL ASSESSMENT OUTSIDE PWS - FISH SHELLFISH STUDY NO 24 - ONE OF TWO RPTS COMPRISING STUDY NO 24
FS024	INTERIM RPT	OS01	1989	333908	333936	900112	CHAN, SINLAM; CLARK, ROBERT C; COLLIER, TRACY K; GRONLUND, WILLIAM D; VARANASI, USHA;KRAHN, MARGARET M;LANDAHL, JOHN T;STEIN, JOHN E	OIL SPILL PROGRESS RPT SHELLFISH & GROUNDFISH TRAWL ASSESSMENT OUTSIDE PWS # FISH / SHELLFISH STUDY NO 24 - PART B EXPOSURE TO OIL & ITS EFFECTS (PART B TO ACE 463906 - NEVER INCLUDED

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								BEFORE AT ALL)
FS024	DETAIL PLAN	OS03	1991	30449255	30449277	000000	VARANASI, USHA;NOAA;NMFS; ADFG	EVOS FISHEIRES IMPACT ASSESSMENT PROGRAMS - ASSESSMENT OF OIL SPILL IMPACTS ON FISHERY RESOURCES - MEASURMENT OF HYDROCARBONS & THEIR METABOLITES, & THEIR EFFECTS, IN IMPORTANT SPECIES # FISH / SHELLFISH STUDY NO 24
FS025	DETAIL PLAN	OS01	1989	5582823	5582832	891012	CONSULTING BIOMETRICIAN; FRED; J, B; KAILL, MICHAEL; NMFS; OSIAR DIR; OSIAR PROGRAM MANAGER; OSIAR SENIOR BIOMETRICIAN	STATE / FED NRDA DETAILED STUDY PLAN - INJURY TO SCALLOP RESOURCES IN KODIAK WATERS # FISH SHELLFISH STUDY NO 25
FS025	INTERIM RPT	OS02	1989	30090369	30090381	000000		NRDA PLAN CERCLA - DRAFT PRELIMINARY STATUS RPT - INJURY TO SCALLOP RESOURCES IN KODIAK WATERS # FISH / SHELLFISH STUDY NO 25
FS026	DETAIL PLAN	OS01	1989	8481568	8481591	891001	ADFGDCF; DEC; DIRECTOR; DONALDSON, WILLIAM; NMFS; OSIAR; PROGRAM MANAGER	STATE / FED NRDA DETAILED STUDY PLAN - SEA URCHIN INJURY - ASSESSMENT IMPACTS OF OIL ON GREEN SEA URCHINS STRONGYLOCENTROTUS DROEBACHIENSIS IN THE KODIAK ISLAND AREA # FISH SHELLFISH STUDY NUMBER 26
FS026	INTERIM RPT	OS01	1989	463965	463999	900100	ADFGDCF; BYERSDORFER, SUSIE; DONALDSON, WILLIAM	SEA URCHIN INJURY ASSESSMENT OF IMPACTS OF OIL ON GREEN SEA URCHINS STRONGYLOCENTROTUS DROEBACHIENSIS IN THE KODIAK ISLAND AREA FISH SHELLFISH STUDY NO 26
FS026	INTERIM RPT	OS02	1989	30090382	30090415	900100	DONALDSON, WILLIAM; BYERSDORFER, SUSIE; ADFGDCF	SEA URCHIN INJURY - ASSESSMENT OF IMPACTS OF OIL SPILL ON GREEN SEA URCHINS, STRONGYLOCENTROTUS

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								DROEBACHIENSIS, IN THE KODIAK ISLAND AREA # FISH / SHELLFISH STUDY NO 26
FS027	DETAIL PLAN	OS01	1990	644410	644421	900226	ADFGDCF; FRED; KOENINGS, JEFF P; SCHMIDT, DANA; TARBOX, KENNETH E	STATE / FED NRDA DETAILED STUDY PLAN - SOCKEYE SALMON OVERESCAPEMENT
FS027	INTERIM RPT	OS02	1990	30092174	30092184	901202	KOENINGS, JEFF;SCHMIDT, DANA;TARBOX, KEN;ADFG; FRED;BARRETT, BRUCE;KYLE, GARY;EDMUNDSON, JIM;KING, BRUCE;HONNELL, STEVE; USFWS	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - SOCKEYE SALMON OVERESCAPEMENT # FISH / SHELLFISH STUDY NO 27
FS027	DETAIL PLAN	OS01	1991	446771	446782	910208	KOENINGS, JEFF;USFWS	STATE / FED NRDA DETAILED STUDY PLAN # RE SOCKEYE SALMON OVERESCAPEMENT
FS027	INTERIM RPT	OS04	1991	30449483	30449502	911202	SCHMIDT, DANA;TARBOX, KEN;BARRETT, BRUCE;KYLE, GARY;EDMUNDSON, JIM;KING, BRUCE;HONNELL, STEVE; HASBROUCK, JIM;BRANNIAN, LINDA;ADFGDCF;FRED;USFWS	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - SOCKEYE SALMON OVERESCAPEMENT # FISH / SHELLFISH STUDY NO 27
FS027	DETAIL PLAN	OS01	1992	30016443	30016450	920125	SCHMIDT, DANA;TARBOX, KEN	REVISED STUDY PLAN SOCKEYE SALMON OVERESCAPEMENT - STATE / FED NRDA
FS027	INTERIM RPT	OS09	1992	10989989	10990059	930715	SCHMIDT, DANA;TARBOX, KEN;BARRETT, BRUCE;KYLE, GARY;EDMUNDSON, JIM;KING, BRUCE;HONNOLD, STEVE; BRANNIAN, LINDA;SWANTON, CHARLES;SHIELDS, PAT; EDMUNDSON, JOHN;ROCHE, PATRICIA;CARLSON, STAN; ADFG;FRED;ADFGDCF;USFWS	STATE - FED NRDA STATUS RPT - SOCKEYE SALMON OVERESCAPEMENT # STUDY NO 27
FS028	INTERIM RPT	OS02	1990	30092185	30092192	901130	EGGERS, DONALD;QUINN, TERRANCE J;COLLIE, JEREMY S;KRUSE, GORDON; FRIED, STEPHEN M;SCHMIDT, DANA C;GATES, RICHARD B; SHARR, SAMUEL;YUEN,	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - SALMON OIL SPILL INJURY MODEL & RUN RECONSTRUCTION # FISH / SHELLFISH STUDY NO 28

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							HENRY J;BUE, BRIAN G; ADFGDCF;UAF	
FS028	INTERIM RPT	OS05	1991	30449787	30449813	911125	GEIGER, HAROLD J;ADFGDCF; QUINN, TERRANCE J;COLLIE, JEREMY S;UAF;GATES, RICHARD B;KRUSE, GORDON; FRIED, STEPHEN M;BARRETT, BRUCE;SHARR, SAMUEL;YUEN, HENRY J;BUE, BRIAN G	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - SALMON OIL SPILL INJURY MODEL & RUN RECONSTRUCTION # FISH / SHELLFISH STUDY NC 28
FS028	DETAIL PLAN	OS01		30016866	30016883	920127	GEIGER, HAROLD;GATES, RICHARD	RESTORATION SCIENCE PROPOSAL 1992 FIELD SEASON, SALMON OIL SPILL INJURY, LIFE HISTORY & RUN RECONSTRUCTION MODELS
FS028	DETAIL PLAN	OS04	1992	30449616	30449636	920300	GEIGER, HAROLD J;GATES, RICHARD;SHARR, SAM;ADFG; QUINN, TERRANCE J;UAF	RESTORATION SCIENCE PROPOSAL 1992 FIELD SEASON - SALMON OIL SPILL INJURY, LIFE HISTORY, & RUN RECONSTRUCTION MODELS # FISH / SHELLFISH STUDY NO 28
FS028	DETAIL PLAN	OS04	1992	30449612	30449615	920423	QUINN, TERRANCE J;COLLIE, JEREMY S;UAF	RESEARCH PROPOSAL - STOCK RECONSTRUCTION OF PINK SALMON IN PWS # FISH / SHELLFISH STUDY NO 28
FS030	DETAIL PLAN	OS03	1990	788558	788561	900413	ADFGDCF; DICOSTANZA, CARMINE	STATE FED NRDA DETAILED STUDY PLAN DATA BASE MANAGEMENT
FS030	INTERIM RPT	OS02	1990	30092193	30092197	901128	DICOSTANZO, CARMINE; ADFGDCF	DRAFT PRELIMINARY STATUS RPT - DATA BASE MANAGEMENT # FISH / SHELLFISH STUDY NO 30
FS030	INTERIM RPT	OS01	1991	8082931	8082948	910604	ADFG	EVOS DATABASES SUMMARIES ADFG, HABITAT DIVISIONS JUN 04 1991 # ATTACHED ARE COPIES OF FAXES, MEMO
FS030	DETAIL PLAN	OS01	1992	30016451	30016469	920301	DICOSTANZO, CARMINE; SIMONSON, BRUCE	DETAILED STUDY PLAN DATABASE MANAGEMENT # MAR 01 1992 - FEB 28 1993

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
FS030	FINAL RPT	OS10	1991	30287702	30287723	000000	DICOSTANZO, CARMINE; SIMONSON, BRUCE P;ADFGDCF	STATE - FED NRDA FINAL RPT - DATABASE MANAGEMENT # FISH - SHELLFISH STUDY NO 30
FS052	DETAIL PLAN	OS01	1992	30016954	30016974	920301	BECHTOL, WILLIAM	ROCKFISH & LINGCOD RESTORATION # STATE / FED NATURAL RESOURCE RESTORATION DETAILED STUDY PLAN
MM001	DETAIL PLAN	OS03	1989	30449049	30449107	890925	LOUGHLIN, THOMAS R; DAHLHEIM, MARILYN;NOAA; USDI;USFS;DNR	EFFECTS OF THE EVOS ON THE DISTRIBUTION & ABUNDANCE OF HUMPBACK WHALES IN PWS, SOUTHEAST AK, & THE KODIAK ARCHIPELAGO # MARINE MAMMALS STUDY NO 1
MM001	INTERIM RPT	OS03	1989	30449392	30449403	000000	DAHLHEIM, MARILYN E; LOUGHLIN, THOMAS R;NOAA	EFFECTS OF THE EVOS ON THE DISTRIBUTION & ABUNDANCE OF HUMPBACK WHALES IN PWS, SOUTHEAST AK, & THE KODIAK ARCHIPELAGO # MARINE MAMMALS STUDY NO 1
MM001	DETAIL PLAN	OS01	1990	526079	526107	900228	AK FISHERIES SCIENCE CENTER; BRAHAM, HOWARD W; DAHLHEIM, MARILYN E; LOUGHLIN, THOMAS R; NATL MARINE MAMMAL LABORATORY; NOAA; WEJAK, JOANNE	EFFECTS OF THE EVOS ON THE DISTRIBUTION & ABUNDANCE OF HUMPBACK WHALES IN PWS SE AK & THE KODIAK ARCHIPELAGO # PROPOSAL FOR STUDY INCLUDES ATTACHMENTS REFERENCED IN TEXT
MM001	INTERIM RPT	OS02	1990	30092198	30092207	901100	DAHLHEIM, MARILYN E; LOUGHLIN, THOMAS R	EFFECTS OF THE EVOS ON THE DISTRIBUTION & ABUNDANCE OF HUMPBACK WHALES IN PWS, SOUTHEAST AK, & THE KODIAK ARCHIPELAGO # MARINE MAMMALS STUDY NO 1
MM002	DETAIL PLAN	OS03	1989	30449108	30449167	890925	LOUGHLIN, THOMAS R; DAHLHEIM, MARILYN;NOAA; USDI;USFS;DNR	ASSESSMENT OF INJURIES TO KILLER WHALES IN PWS, KODIAK ARCHIPELAGO, & SOUTHEAST AK # MARINE MAMMALS STUDY NO 2

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
MM002	INTERIM RPT	OS03	1989	30449379	30449391	000000	DAHLHEIM, MARILYN E; LOUGHLIN, THOMAS R;NOAA	ASSESSMENT OF INJURIES TO KILLER WHALES IN PWS, KODIAK ARCHIPELAGO, & SOUTHEAST AK # MARINE MAMMALS STUDY NO 2
MM002	DETAIL PLAN	OS01	1990	526061	526078	900228	AK FISHERIES SCIENCE CENTER; BRAHAM, HOWARD W; DAHLHEIM, MARILYN E; LOUGHLIN, THOMAS R; NATL MARINE MAMMAL LABORATORY; NOAA; WEJAK, JOANNE	ASSESSMENT OF INJURIES TO KILLER WHALES IN PWS KODIAK ARCHIPELAGO & SE AK # PROPOSED STUDY INCLUDES ATTACHMENTS REFERENCED IN TEXT
MM002	INTERIM RPT	OS02	1990	30052523	30052535	901100	DAHLHEIM, MARILYN E; LOUGHLIN, THOMAS R;AK FISHERIES SCIENCE CENTER	ASSESSMENT OF INJURIES TO KILLER WHALES IN PWS, KODIAK ARCHIPELAGO, & SOUTHEAST AK # MARINE MAMMALS STUDY NO 2
MM002	DETAIL PLAN	OS03	1991	30449372	30449378	910111	DAHLHEIM, MARILYN E; LOUGHLIN, THOMAS R;NOAA; USDI;USFS;DNR	ASSESSMENT OF INJURIES TO KILLER WHALES IN PWS, KODIAK ARCHIPELAGO, & SOUTHEAST AK # MARINE MAMMALS STUDY NO 2
MM002	INTERIM RPT	OS01	1991	30015933	30015943	911100	DAHLHEIM, MARILYN E; LOUGHLIN, THOMAS R	ASSESSMENT OF INJURIES TO KILLER WHALES IN PWS
MM002	INTERIM RPT	OS05	1991	30150240	30150291	910000	HEISE, KATHY;ELLIS, GRAEME;MATKIN, CRAIG	A CATALOGUE OF PWS KILLER WHALES # MARINE MAMMAL STUDY NO 2
MM003	DETAIL PLAN	OS03	1989	30449034	30449048	890925	LOUGHLIN, THOMAS R;USDI; USFS;DNR;NOAA	CETACEAN NECROPSIES TO DETERMINE INJURY FROM THE EVOS # MARINE MAMMALS STUDY NO 3
MM003	INTERIM RPT	OS01		30416038	30416044	000000	LOUGHLIN, THOMAS R	CETACEAN NECROPSIES TO DETERMINE INJURY FROM THE EVOS # MARINE MAMMALS STUDY NO 3
MM004	DETAIL PLAN	OS01	1989	5958610	5958624	891020	CALKINS, DONALD G;ADFG; USDI;USDA;NOAA;DNR	STATE - FED NRDA DETAILED STUDY PLAN, APR 1989 - FEB 1990 # PROJECT TITLE ASSESSMENT OF INJURY TO

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								STELLER SEA LIONS IN PWS & THE GULF OF AK - STUDY ID NO MARINE MAMMALS STUDY NO 4
MM004	DETAIL PLAN	OS01	1990	526046	526059	900312	CALKINS, DONALD G; NOAA	STATE FED NRDA DETAILED STUDY PLAN APR 1989 - FEB 1990 ASSESSMENT OF INJURY TO STELLER SEA LIONS IN PWS & THE GULF OF AK # PROPOSED STUDY
MM004	INTERIM RPT	OS01	1990	30032959	30032973	900115	CALKINS, DONALD G; LOUGHLIN, TOM;BECKER, EARL;MCALLISTER, DENNIS; ADFG	ASESSMENT OF INJURY TO SEA LIONS IN PWS & THE GULF OF AK - MARINE MAMMAL STUDY NO 4 # PRELIMINARY STATUS RPT FOR APR - DCM 1990
MM004	INTERIM RPT	OS02	1990	30092221	30092231	901127	CALKINS, DONALD G;BECKER, EARL;ADFG	ASSESSMENT OF INJURY TO SEA LIONS IN PWS & THE GULF OF AK # MARINE MAMMAL STUDY NO 4
MM005	DETAIL PLAN	OS01	1989	5999716	5999734	891019	FROST, KATHRYN J;ADFG; CALKINS, DONALD G;USDI; NOAA;USDA;DNR	STATE - FED NRDA DETAILED STUDY PLAN, APR 1989 - FEB 1990 # PROJECT TITLE ASSESSMENT OF INJURY TO HARBOR SEALS IN PWS & ADJACENT AREAS - STUDY ID NO MARINE MAMMALS STUDY NO 5
MM005	INTERIM RPT	OS05	1989	30449657	30449683	900112	FROST, KATHRYN J;ADFG; LOWRY, LLOYD;PITCHER, KEN;MCALLISTER, DENNIS; CALKINS, DON;LOUGHLIN, TOM;SINCLAIR, BETH; BECKER, EARL;REED, DAN; DELONG, ROB;SPRAKER, TERRY;HAEBLER, RAMONA	STATE / FED NRDA FOR APR - DCM 1989 - PRELIMINARY STATUS RPT - ASSESSMENT OF INJURY TO HARBOR SEALS IN PWS, AK & ADJACENT AREAS # MARINE MAMMALS STUDY NO 5
MM005	DETAIL PLAN	OS01	1990	526262	526279	900223	FROST, KATHRYN J; NOAA	STATE FED NRDA DETAILED STUDY PLAN MAR 1990 - FEB 1992 ASSESSMENT OF INJURY TO HARBOR SEALS IN PWS & ADJACENT AREAS # MARINE MAMMALS STUDY NUMBER 5

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
MM005	INTERIM RPT	OS02	1990	30092232	30092275	901128	FROST, KATHRYN J;LOWRY, LLOYD;PITCHER, KEN; MCALLISTER, DENNIS; CALKINS, DONALD;LOUGHLIN, TOM;SINCLAIR, BETH; BECKER, EARL;REED, DAN; DELONG, ROB;SPRAKER, TERRY;HAEBLER, RAMONA; ADFG	STATE / FED NRDA FOR APR 1989 - DCM 1990 - ASSESSMENT OF INJURY TO HARBOR SEALS IN PWS, AK, & ADJACENT AREAS # MARINE MAMMALS STUDY NO 5
MM005	DETAIL PLAN	OS01	1991	7981006	7981020	910201	FROST, KATHRYN;NOAA;ADFG; DNR;USDOI;USDOA	STATE FED NRDA DETAILED STUDY PLAN, MAR 1991 - FEB 1992 # NRDA ASSESSMENT OF INJURY TO HARBOR SEALS IN PWS & ADJACENT AREAS - MARINE MAMMALS STUDY NUMBER 5, FY 1991 - 1992
MM005	INTERIM RPT	OS01	1991	30015966	30016016	911120	FROST, KATHRYN J	1991 STATUS RPT - ASSESSMENT OF INJURY TO HARBOR SEALS IN PWS, AK & ADJACENT AREAS
MM006	DETAIL PLAN	OS01	1989	373571	373609	890915	DEGANGE, ANTHONY R;BURN, DOUGLAS M;USFWS;NICKLES, JON	ASSESSMENT OF THE MAGNITUDE, EXTENT , & DURATION OF OIL SPILL IMPACTS ON SEA OTTER POPULATIONS IN AK # NRDA MARINE MAMMAL STUDY NUMBER 6
MM006	INTERIM RPT	OS01	1989	30442848	30442913	900112	DEGANGE, ANTHONY R;BURN, DOUGLAS M	ASSESSMENT OF THE MAGNITUDE, EXTENT, & DURATION OF OIL SPILL IMPACTS ON SEA OTTER POPULATIONS OF AK
MM006	DETAIL PLAN	OS01	1990	788456	788519	900321	DEGANGE, ANTHONY;USFWS; BURN, DOUGLAS M	REVISION TO MARINE MAMMALS STUDY 6A SECTION 4.3 # ENCLOSING ASSESSMENT OF THE MAGNITUDE, EXTENT & DURATION OF OIL SPILL IMPACTS ON SEA OTTER POPULATIONS IN AK, & MARINE MAMMALS STUDY NO 6B, 6C, & 7
MM006	INTERIM RPT	OS07	1990	30286411	30286572	901119	BALLACHEY, BE;BODKIN, JL; BURN, D	ASSESSMENT OF THE MAGNITUDE, EXTENT, & DURATION OF OIL SPILL IMPACTS ON SEA OTTER

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								POPULATIONS IN AK # DRAFT PRELIMINARY STATUS RPT
MM006	INTERIM RPT	OS01	1991	30444124	30444144	910801	ROTTERMAN, LISA;MONNETT, CHARLES	MORTALITY OF SEA OTTER WEANLINGS IN EASTERN & WESTERN PWS, AK, DURING THE WINTER OF 1990-1991
MM006	INTERIM RPT	OS01	1991	30444145	30444173	910815	ROTTERMAN, LISA;MONNETT, CHARLES	MORTALITY & REPRODUCTION OF SEA OTTERS OILED & TREATED AS A RESULT OF THE EVOS
MM006	INTERIM RPT	OS01	1991	30444000	30444123	911122	BALLACHEY, BE;BODKIN, JL; BURN, DOUGLAS M	ASSESSMENT OF THE MAGNITUDE, EXTENT, & DURATION OF OIL SPILL IMPACTS ON SEA OTTER POPULATIONS OF AK # DRAFT PRELIMINARY STATUS RPT
MM006	INTERIM RPT	OS01	1992	30444384	30444585	920512	BALLACHEY, BE;BODKIN, JL; BURN, DOUGLAS M	ASSESSMENT OF THE MAGNITUDE, EXTENT, & DURATION OF OIL SPILL IMPACTS ON SEA OTTER POPULATIONS OF AK # DRAFT PRELIMINARY STATUS RPT - REVISED 920512
MM007	DETAIL PLAN	OS01	1990	788520	788529	900316	DEGANGE, ANTHONY R;USFWS	ASSESS THE FATE OF SEA OTTERS OILED & REHABILITATED AS A RESULT OF THE EVOS # MARINE MAMMAL STUDY NO 7
MM007	DETAIL PLAN	OS01	1990	788530	788549	900316	HAEBLER, MONA;DPA;HARRIS, KEITH;DEGANGE, ANTHONY R; USFWS	ASSESS THE PATHOLOGICAL PROCESSESS & MECHANISMS OF TOXICITY IN SEA OTTERS THAT DIED AT REHABILITATION CENTERS FOLLOWING THE EVOS # MARINE MAMMALS STUDY NO 7
MM007	INTERIM RPT	OS01	1989	30444768	30444789	900112	DEGANGE, ANTHONY R	ASSESSMENT OF THE FATE OF SEA OTTERS OILED & REHABILITATED AS A RESULT OF THE EVOS
MM007	INTERIM RPT	OS01	1990	30445152	30445160	901100	MONNETT, CHARLES; ROTTERMAN, LISA M	ASSESSMENT OF THE FATE OF SEA OTTERS OILED & TREATED AS A RESULT OF THE EVOS

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
MM082	DETAIL PLAN	OS02	1992	30066224	30066237	911104	DAHLHEIM, MARILYN E; LOUGHLIN, THOMAS R;NOAA	KILLER WHALE MONITORING & HABITAT STUDIES # MARINE MAMMALS STUDY NO 6 WRITTEN ON DOC
MM082	DETAIL PLAN	OS01	1992	30016560	30016572	920127	DAHLHEIM, MARILYN; LOUGHLIN, THOMAS	KILLER WHALE MONITORING & HABITAT STUDIES
RE000	DETAIL PLAN	OS03	1992	30136180	30136181	000000	KOSKI, KV;NMFS	PROJECT PROPOSAL - STREAM CARRYING CAPACITY FOR EVALUATING RESTORATION IN PWS # RESTORATION STUDY NO 00
RE000	DETAIL PLAN	OS03	1991	30136260	30136262	911100	IRVINE, GAIL;NPS	MONITORING THE FATE & PERSISTENCE OF OIL IN NATL PARKS AFFECTED BY THE EVOS - A RESTORATION SCIENCE STUDY PROPOSAL # RESTORATION STUDY NO 00
RE003	DETAIL PLAN	OS06	1991	9006191	9006198	910524	WILLETTE, MARK;DUDIAK, NICK;WHITE, LORNE;ADFG; USDA;USFS	RESTORATION IMPLEMENTATION PROJECT WORK PLAN - RESTORATION SURVEY FOR WILD PINK & SALMON # PROJECT NO 3
RE003	INTERIM RPT	OS02	1991	30136211	30136254	911122	WILLETTE, MARK;DUDIAK, NICK;WHITE, LORNE; CARPENTER, GREG;BOYLE, LARRY;HONNOLD, STEVE; ADFG;FRED	RESTORATION IMPLEMENTATION PROJECT - DRAFT STATUS RPT - SURVEY & EVALUATION OF INSTREAM HABITAT & STOCK RESTORATION TECHNIQUES FOR WILD PINK & CHUM SALMON # RESTORATION STUDY NO 3
RE004	PRE PEER RPT	OS01	1991	30446304	30446351	910530	KULETZ, KATHY;USFWS	IDENTIFICATION OF UPLAND HABITATS USED BY WILDLIFE AFFECTED BY THE EVOS - MARBLED MURRELETS # DRAFT FINAL RPT
RE004	PRE PEER RPT	OS01	1991	30447456	30447502	910927	KULETZ, KATHY;USFWS	IDENTIFICATION OF UPLAND HABITATS USED BY WILDLIFE AFFECTED BY THE EVOS - MARBLED MURRELETS

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
RE004	FINAL RPT	OS01	1991	30447840	30447878	910927	KULETZ, KATHY;USFWS	IDENTIFICATION OF UPLAND HABITATS USED BY WILDLIFE AFFECTED BY THE EVOS - MARBLED MURRELETS # REVISED 920512
RE004	INTERIM RPT	OS01	1991	30446688	30446693	911120	KULETZ, KATHY;USFWS	INTERIM SUMMARY OF THE 1991 MARBLED MURRELET RESTORATION PROJECT
RE005	DETAIL PLAN	OS01	1992	30016470	30016508	920300	SELLERS, RICHARD	PRODUCTIVITY & SURVIVAL OF BROWN BEARS LONG TERM IMPACTS OF EVOS
RE006	DETAIL PLAN	OS01	1992	30016884	30016944	920300	BALLACHEY, BE;BODKIN, JL	SEA OTTER RESTORATION PROJECT # MAR 1992 - FEB 1993
RE007	DETAIL PLAN	OS06	1991	30484436	30484454	910502	HOFFMANN, ANDREW G; MCCARRON, SUZANNE	TECHNICAL SUPPORT STUDY FOR THE RESTORATION OF DOLLY VARDEN CUTTHROAT TROUT POPULATIONS IN PWS # OPERATIONAL PLAN
RE007	INTERIM RPT	OS02	1991	30136136	30136178	911120	HOFFMAN, ANDREW;MCCARRON, SUZANNE;HEPLER, KELLY; HANSEN, PATRICIA;ADFGDSF; ADFG	RESTORATION SCIENCE STUDY DRAFT 1991 INTERIM RPT - TECHNICAL SUPPORT STUDY FOR THE RESTORATION OF DOLLY VARDEN & CUTTHROAT TROUT POPULATIONS IN PWS # RESTORATION SCIENCE STUDY 7
RE010	DETAIL PLAN	OS02	1991	30448096	30448141	920229	GIBBONS, DAVE;USFS; HIGHSMITH, RAYMOND C;UAF; HOOTEN, ANTHONY J; VANTAMLEN, PETER;STEKOLL, MICHAEL S	EVOS COASTAL HABITAT PROJECT HERRING BAY EXPERIMENTAL FIELD STATION 1991 FIELD EXPERIMENTS - RESTORATION MONITORING & FEASIBILITY # RESTORATION STUDY NO 10
RE011	DETAIL PLAN	OS01	1992	30016509	30016536	920301	NYSEWANDER, DAVID;DIPPEL, CHRIS	MONITORING RATE OF RECOVERY OR CONTINUING CHANGES OF MURRE NOS & PRODUCTIVITY IN SEA BIRD COLONIES IN OR DOWNSTREAM FROM EVOS

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
RE013	DETAIL PLAN	OS01	1992	30016537	30016550	920127	LAING, KAREN;BURN, DOUG	SURVEYS TO MONITOR MARINE BIRD & SEA OTTER POPULATIONS IN AREA OF EVOS
RE015	DETAIL PLAN	OS01	1992	30002009	30002028	920300	KULETZ, KATHY	IDENTIFICATION OF UPLAND NESTING HABITAT OF MARBELED MURRELET IN THE EVOS ZONE
RE017	INTERIM RPT	OS01	1991	30448224	30448253	911100	ANDRES, BRAD	FEEDING ECOLOGY & REPRODUCTIVE SUCCESS OF BLACK OYSTERCATCHERS IN PWS
RE017	INTERIM RPT	OS01	1991	30448608	30448638	911100	ANDRES, BRAD	FEEDING ECOLOGY & REPRODUCTIVE SUCCESS OF BLACK OYSTERCATCHERS IN PWS # REVISED 920512
RE017	DETAIL PLAN	OS01	1992	30016551	30016558	920401	ANDRES, BRAD	REPRODUCTIVE SUCCESS OF BLACK OYSTERCATCHERS IN PWS
RE020	DETAIL PLAN	OS01	1992	30017153	30017161	920301	SCHEMPF, PHILLIP	BALD EAGLE RESTORATION STUDY FEB 1993 & MAR - DCM 1993
RE032	DETAIL PLAN	OS03	1992	30136263	30136272	911119	FEDER, HOWARD M;UAF	RESEARCH PRE-PROPOSAL / INJURY & RECOVERY OF DEEP BENTHIC MACROFAUNAL COMMUNITIES # RESTORATION STUDY NO 32
RE039	DETAIL PLAN	OS03	1992	30136186	30136188	000000	OLSON, ROBERT;USFS	PROJECT PROPOSAL - FISH LIMITING HABITAT FACTORS ANALYSIS # RESTORATION STUDY NO 39
RE040	DETAIL PLAN	OS03	1992	30136189	30136192	000000	OLSON, ROBERT;USFS	PROJECT PROPOSAL - PWS WILD FISH STOCK INFO ASSESSMENT # RESTORATION STUDY NO 40
RE042	DETAIL PLAN	OS03	1992	30136255	30136257	000000	WEDEMYER, KATE;USFS	WESTERN PWS RESTORATION SURVEY & PROJECT PLANNING # RESTORATION STUDY NO 42
RE044	DETAIL PLAN	OS03	1992	30136258	30136259	000000	HEPLER, K;ADFGDSF;SCHMID, D;USFS	ANADROMOUS SPORT FISH STATUS & EVALUATION # RESTORATION STUDY NO 44

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
RE046	DETAIL PLAN	OS03	1992	30136193	30136195	000000	WILLETTE, MARK;CARPENTER, GREG;FRED	RESTORATION SCIENCE PROPOSAL 1992 FIELD SEASON - IDENTIFICATION OF SUITABLE EARLY-RUN PINK SALMON STOCKS FOR DEVELOPMENT AS BROODSTOCK AT PWS HATCHERIES # RESTORATION STUDY NO 46
RE047	DETAIL PLAN	OS01	1992	30017083	30017093	920300	KUWADA, MARK;SUNDET, KATHRIN	RESTORATION PROPOSAL STREAM HABITAT ASSESSMENT FEB 1993 & MAR - DCM 1993
RE047	FINAL RPT	OS09	1992	30418236	30418348	930200	KUWADA, MARK N;SUNDET, KATHRIN;ADFGHD	STREAM HABITAT ASSESSMENT PROJECT - AFOGNAK ISLAND # PROJECT NO R-47
RE048	DETAIL PLAN	OS03	1991	30136274	30136275	911120	COCHRAN, JAMES O;FRED; TROWBRIDGE, CHARLES; JOHNSON, J;ADFGDCF	RESTORATION SCIENCE STUDY PROPOSAL - BIVALVE SHELLFISH RESTORATION & ENHANCEMENT # RESTORATION STUDY NO 48
RE049	DETAIL PLAN	OS03	1992	30136276	30136277	000000	COCHRAN, JAMES O;FRED; ADFG	RESTORATION SCIENCE STUDY PROPOSAL 1992 FIELD SEASON - INTERTIDAL & SUBTIDAL RESTORATION NEEDS ASSESSMENT SURVEY # RESTORATION STUDY NO 49
RE050	DETAIL PLAN	OS03	1992	30136278	30136280	000000	TROWBRIDGE, CHARLES; VINING, IVAN;ADFGDCF	RESTORATION SCIENCE STUDY PROPOSAL 1992 FIELD SEASON - TANNER CRAB POPULATION MONITORING & RESTORATION # RESTORATION STUDY NO 50
RE051	DETAIL PLAN	OS03	1992	30136281	30136283	000000	JEWETT, STEPHEN C;DEAN, THOMAS A;ADFG;UAF	NATURAL RESTORATION OF THE SHALLOW SUBTIDAL COMMUNITIES IN PWS # RESTORATION STUDY NO 51
RE052	DETAIL PLAN	OS03		30136284	30136288	000000	BECHTOL, WILLIAM;HOFFMAN, ANDREW;SEEB, LISA;HANSEN, PATRICIA;VINING, IVAN; ADFG	RESTORATION SCIENCE STUDY PROPOSAL - DEVELOPMENT OF A RESTORATION PLAN FOR GROUNDFISH STOCKS AFFECTED

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								BY THE EVOS # RESTORATION STUDY NO 52
RE053	DETAIL PLAN	OS03	1992	30136196	30136199	000000	TARBOX, KENNETH;BRANNIAN, LINDA;ADFG	RESTORATION SCIENCE STUDY PROPOSAL 1992 FIELD SEASON - KENAI RIVER SOCKEYE SALMON RESTORATION # RESTORATION STUDY NO 53
RE053	DETAIL PLAN	OS01	1992	30016975	30016989	920131	TARBOX, KENNETH	DETAILED STUDY PLAN KENAI RIVER SOCKEYE SALMON RESTORATION
RE054	DETAIL PLAN	OS03	1992	30136289	30136291	000000	TROWBRIDGE, CHARLES; VINING, IVAN;ADFGDCF; PAUL, AJ;UNI OF AK;ADFG	RESTORATION SCIENCE STUDY PROPOSAL 1992 FIELD SEASON - JUVENILE SPOT SHRIMP HABITAT # RESTORATION STUDY NO 54
RE055	DETAIL PLAN	OS03	1992	30136292	30136294	000000	TROWBRIDGE, CHARLES;SEEB, LISA;VINING, IVAN; ADFGDCF;COCHRAN, JAMES; FRED;ADFG	RESTORATION SCIENCE STUDY PROPOSAL 1992 FIELD SEASON - SPOT SHRIMP RESTORATION # RESTORATION STUDY NO 55
RE057	DETAIL PLAN	OS03	1992	30136129	30136131	000000	BIGGS, EVELYN;BAKER, TIM; ADFGDCF;ADFG	RESTORATION SCIENCE STUDY PROPOSAL 1992 FIELD SEASON - HERRING SUBSTRATE & EGG TRANSPLANTING STUDIES # RESTORATION STUDY NO 57
RE058	DETAIL PLAN	OS03	1992	30136132	30136135	000000	BIGGS, EVELYN;SEEB, LISA; BAKER, TIM;ADFGDCF;ADFG	RESTORATION SCIENCE STUDY PROPOSAL 1992 FIELD SEASON - HERRING RESTORATION & MONITORING # RESTORATION STUDY NO 58
RE059	DETAIL PLAN	OS03	1992	30136200	30136203	911122	SEEB, JAMES;FRED;SEEB, LISA;ADFGDCF	RESTORATION SCIENCE STUDY PROPOSAL GENETICS STUDIES OF SALMONIDS - ASSESSMENT OF GENETIC STOCK STRUCTURE OF SALMONIDS FOR RESTORATION PLANNING & MONITORING # RESTORATION STUDY NO 59
RE059	DETAIL PLAN	OS01	1992	30016587	30016612	920127	SEEB, JAMES;SEEB, LISA	DETAILED STUDY PLAN

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								ASSESSMENT OF GENETIC STOCK STRUCTURE OF SALMONIDS
RE061	DETAIL PLAN	OS03	1992	30136204	30136206	000000	SEEB, JAMES E;HASBROUCK, JAMES J;FRED	RESTORATION SCIENCE STUDY PROPOSAL 1992 FIELD SEASON - MONITORING DNA BREAKAGES OF FISH & SHELLFISH POPULATIONS IN PWS # RESTORATION STUDY NO 61
RE062	DETAIL PLAN	OS03	1992	30136207	30136210	000000	WILLETTE, MARK;FRED; SEVERIN, KENNETH;UAF; HASBROUCK, JAMES	RESTORATION SCIENCE PROPOSAL 1992 FIELD SEASON - SALMON STOCK SEPARATION USING OTILITH BANDING PATTERNS & MICROCHEMISTRY # RESTORATION STUDY NO 62
RE071	DETAIL PLAN	OS01	1992	30017094	30017150	920129	PATTEN, SAMUEL	STATE / FED HARLEQUIN DUCK RESTORARION & RESTORATION MONITORING STUDIES BUDGET PROPOSAL FOR 1992 FEB 1993 & MAR - DCM 1993
RE073	DETAIL PLAN	OS01	1991	8037665	8037667	910000	FROST, KATHRYN J;ADFG	PROPOSED 1991 RESTORATION PROJECT DESCRIPTION PROPOSED 1991 FEASIBILITY STUDY DESCRIPTION, HABITAT USE & BEHAVIOR OF HARBOR SEALS IN PWS
RE073	INTERIM RPT	OS05	1991	30449642	30449656	911119	FROST, KATHRYN J;ADFG; NOAA	EVOS RESTORATION STUDY 1991 PROGRESS RPT - HABITAT USE, BEHAVIOR, & MONITORING OF HARBOR SEALS IN PWS # RESTORATION STUDY NO 73
RE073	DETAIL PLAN	OS01	1992	30016991	30017008	920301	FROST, KATHRYN;LEWIS, JONATHAN	RESTORATION IMPLEMENTATION, HABITAT USE, BEHAVIOR & MONITORING OF HARBOR SEALS IN PWS
RE074	DETAIL PLAN	OS03	1992	30136295	30136297	000000	OCLAIR, CHARLES;RICE; STANLEY;NMFS;NOAA	PROPOSAL FOR RESTORATION SCIENCE STUDY 1992 FIELD SEASON - RECOVERY MONITORING OF HYDROCARBON-CONTAMINATED

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								SUBTIDAL MARINE SEDIMENT RESOURCES # RESTORATION STUDY NO 74
RE074	DETAIL PLAN	OS01	1992	30002029	30002039	920301	RICE, STANLEY;OCLAIR, CHARLES	RECOVERY MONITORING OF HYDROCARBON CONTAMINATED SUBTIDAL MARINE SEDIMENT RESOURCES # DATES OF STUDY PLAN / MAR 01 1992 - FEB 28 1993
RE075	DETAIL PLAN	OS03	1992	30439694	30439698	000000	VARANASI, USHA;NOAA	NATURAL RECOVERY OF SUBTIDAL SPECIES IN PWS # RESTORATION STUDY NO 75
RE075	DETAIL PLAN	OS01	1992	30017169	30017207	920300	VARANASI, USHA	RESTORATION SCIENCE PLAN NATURAL RECOVERY OF SUBTIDAL SPECIES IN PWS # FEB 1993FEB 1993 & MAR - DCM 1993
RE077	DETAIL PLAN	OS03	1992	30439690	30439693	000000	VARANASI, USHA;NOAA	MONITORING RECOVERY OF INTERTIDAL & NEARSHORE SUBTIDAL SPECIES IN PWS # RESTORATION STUDY NO 77
RE078	DETAIL PLAN	OS03	1992	30136303	30136305	000000	RICE, STANLEY;SHORT, JEFFREY;NOAA	PROPOSAL FOR RESTORATION SCIENCE STUDY 1992 FIELD SEASON - MUSSEL TISSUE & SEDIMENT HYDROCARBON DATA SYNTHESIS # RESTORATION STUDY NO 78
RE083	DETAIL PLAN	OS03	1992	30136306	30136310	920701	BRADDOCK, JOAN F;UAF; BROWN, EDWARD J	MONITORING MICROBIAL POPULATIONS IN MARINE SEDIMENT AS INDICATORS OF ENVIRONMENTAL DISTURBANCE & RESTORATION # RESTORATION STUDY NO 83
RE090	DETAIL PLAN	OS01	1992	30016573	30016586	920114	HELPER, KELLY;HUFFMANN, ANDREW;HANSEN, PATRICIA	DETAILED STUDY PLAN ANADROMOUS SPORT FISH STATUS & EVALUATION DOLLY VARDEN & CUTTHROAT TROUT
RE095	DETAIL PLAN	OS01	1992	30016945	30016952	920301	FARO, JIM	RECOVERY MONITORING RIVER

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								OTTER RESTORATION STUDY
RE104	DETAIL PLAN	OS01	1992	30001908	30001920	920300	HOLMES, CHARLES	ARCHAELOGICAL RESOURCE PROTECTION
RE105	DETAIL PLAN	OS01	1992	30017038	30017049	920301	WILLETTE, MARK;DUDIAK, NICK;WHITE, LORNE;ET AL	RESTORATION SCIENCE PROPOSAL 1992 FIELD SEASON - SURVEY & EVALUATION OF INSTREAM HABITAT & STOCK RESTORATION TECHNIQUES FOR ANADROMOUS FISH
RE106	DETAIL PLAN	OS01	1992	30017009	30017025	920124	HOFFMAN, ANDREW;MCCARRON, SUZANNE;HANSEN, PATRICIA; AL, ET	OPERATIONAL PLAN, TECHNICAL SUPPORT STUDY FOR RESTORATION OF DOLLY VARDEN & CUTTHROAT POPULATIONS IN PWS
RE113	DETAIL PLAN	OS01	1992	30017050	30017058	920301	WHITE, LORNE	RESTORATION FOR RED LAKE SOCKEYE SALMON FISHERY
RE114	DETAIL PLAN	OS01	1992	30001921	30001929	920301	WHITE, LORNE	MITIGATION FOR RED LAKE SOCKEYE SALMON FISHERY
RE115	DETAIL PLAN	OS01	1992	30017059	3001073	920301	WILLETTE, MARK;WEDEMEYER, KATE	RESTORATION IMPLEMENTATION PROPOSAL 1992 FIELD SEASON, RESTORATION OF COGHILL LAKE SOCKEYE SALMON STOCK
RE116	DETAIL PLAN	OS01	1992	30017074	30017082	920301	WILLETTE, MARK	RESTORATION IMPLEMENTATION PROPOSAL 1992 FIELD SEASON FRY REARING TO IMPROVE SURVIVAL & RESTORE WILD PINK & CHUM SALMON STOCKS
RE117	DETAIL PLAN	OS01	1992	30001930	30002008	920700	WALL, GARY	FORT RICHARDSON HATCHERY WATER PIPELINE
RE118	DETAIL PLAN	OS01	1992	30017026	30017036	920300	PAYNE, VALERIE	1992 RESTORATION PROJECT PROPOSAL PUBLIC INFO & EDUCATION
RG000	DETAIL PLAN	OS01	1990	30000718	30000904	900700	RESTORATION PLANNING WORK GROUP	RESTORATION FOLLOWING THE EVOS - PROCEEDINGS OF THE PUBLIC SYMPOSIUM

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
RG000	DETAIL PLAN	OS01	1990	30000905	30000984	900800	RESTORATION PLANNING WORK GROUP	RESTORATION PLANNING FOLLOWING THE EVOS - PROGRESS RPT
RG000	DETAIL PLAN	OS01	1990	30001687	30001905	901200	WARREN-HICKS, WILLIAM; NOEL, LYNN E	ECOLOGICAL RESTORATION OF PWS & THE GULF OF AK # BIBLIOGRAPHY OF RELEVANT LITERATURE INCLUDING ABSTRACTS
RG000	DETAIL PLAN	OS01	1991	30001214	30001686	911200	RESTORATION PLANNING WORK GROUP	OPTIONS FOR IDENTIFYING & PROTECTING STRATEGIC FISH & WILDLIFE HABITATS & RECREATION SITES # A GENERAL HANDBOOK
RG999	DETAIL PLAN	OS01	1992	30000655	30000672	920100	JONES & STOKES ASSOC	SUMMARY RPT OF PROGRAMS TO PROTECT & MANAGE MARINE HABITATS
RG999	DETAIL PLAN	OS01	1992	30000673	30000717	920100	JONES & STOKES ASSOC	PROCEEDINGS OF THE WORKSHOP ON PROGRAMS TO PROTECT MARINE HABITATS
RG999	DETAIL PLAN	OS01	1992	30000429	30000467	920300	NUR, NADAV;AINLEY, DAVID G	COMPREHENSIVE REVIEW & CRITICAL SYNTHESIS OF THE LITERATURE ON RECOVERY OF MARINE BIRD POPULATIONS FOR ENVIRONMENTAL PERTURBATIONS
RG999	DETAIL PLAN	OS01	1992	30000468	30000543	920300	NUR, NADAV;AINLEY, DAVID G	COMPREHENSIVE REVIEW & CRITICAL SYNTHESIS OF THE LITERATURE RE RECOVERY OF MARINE BIRD POPULATIONS FROM ENVIRONMENTAL PERTURBATIONS # ANNOTATED BIBLIOGRAPHY
ST001	DETAIL PLAN	OS04	1991	30449600	30449610	920200	RICE, STANLEY D;OCLAIR, CHARLES E;NMFS;UAF	PETROLEUM HYDROCARBON-INDUCED INJURY TO SUBTIDAL MARINE SEDIMENT RESOURCES # SUBTIDAL STUDY NO 1
ST001	DETAIL PLAN	OS01	1991	7981307	7981309	910000		STUDY PLAN - INJURY TO SUBTIDAL SEDIMENT RESOURCES

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								# SUBTIDAL STUDY NO 1B (ST001B)
ST001	INTERIM RPT	OS02	1991	30138699	30138730	911100	RICE, STANLEY D;OCLAIR, CHARLES E;NOAA;NMFS	NRDA DRAFT STATUS RPT - PETROLEUM HYDROCARBON-INDUCED INJURY TO SUBTIDAL MARINE SEDIMENT RESOURCES # SUBTIDAL STUDY NO 1
ST001	FINAL RPT	OS05	1992	30497126	30447326	920600	BRADDOCK, JOAN F;RASLEY, BRIAN T;YEAGER, THOMAS R; BROWN, EDWARD J;UAF; LINDSTROM, JON E;UNI OF ID	HYDROCARBON MINERALIZATION POTENTIALS & MICROBIAL POPULATIONS IN MARINE SEDIMENTS FOLLOWING THE EVOS - FINAL RPT # SUBTIDAL STUDY NO 1
ST002	DETAIL PLAN	OS01	1991	9291418	9291461	910300	JEWETT, STEPHEN C;FEDER, HOWARD M	INJURY TO BENTHIC COMMUNITIES # SUBTIDAL NO 2, ATTACHING APPENDIX A - E
ST002A	FINAL RPT	OS10	1991	30286720	30287059	931200	JEWETT, STEPHEN C;UAF; DEAN, THOMAS A;COASTAL RESOURCES ASSOC; HALDORSON, LEWIS J; STEKOLL, MICHAEL;JNO CENTER FOR FISHERIES & OCEAN SCIENCES;LAUR, DAVID A;UNI OF CA; MCDONALD, LYMAN;W ECOSYSTEMS TECHNOLOGY	THE EFFECTS OF THE EVOS ON SHALLOW SUBTIDAL COMMUNITIES IN PWS AK 1989 - 1991 # FINAL RPT - STUDY NO 2A
ST003	DETAIL PLAN	OS03	1991	30449320	30449327	000000	SHORT, JEFFREY;ROUNDS, PATRICIA;NOAA;NMFS	GEOGRAPHIC & TEMPORAL DISTRIBUTION OF DISSOLVED & PARTICULATE PETROLEUM HYDROCARBONS IN THE WATER COLUMN # SUBTIDAL STUDY NO 3
ST003	DETAIL PLAN	OS01	1991	30416058	30416064	910000	SALE, DAVID M;GIBEAUT, JAMES;DEC	CERCLA / NRDA STUDIES - SUBTIDAL STUDY NO 3 - SUBTIDAL SEDIMENT TRAPS - 1991 STUDY PLAN
ST003	INTERIM RPT	OS06	1991	30416065	30416118	920000	SALE, DAVID M;DEC	DEC EVOS RESPONSE - RESEARCH DIVING PROGRAM - 1991 STATUS RPT # STUDY NO 3

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
ST003	INTERIM RPT	OS02	1991	30065903	30065920	911100	SHORT, JEFFREY;ROUNDS, PATRICIA;NOAA	NRDA DRAFT STATUS RPT - BIO-AVAILABILITY & TRANSPORT OF HYDROCARBONS IN THE NEAR SHORE WATER COLUMN # SUBTIDAL STUDY NO 3
ST003	DETAIL PLAN	OS01	1992	30025156	30025186	920000	SALE, DAVID;GIBEAUT, JAMES;SHORT, JEFFREY	1992 STUDY PLAN BIOAVAILABILITY & TRANSPORT OF HYDROCARBONS # SUBTIDAL STUDY NO 3B (ST003B)
ST004	DETAIL PLAN	OS04	1991	30449587	30449599	910201	WOLFE, DOUGLAS A;NOAA	FATE & TOXICITY OF SPILLED OIL FROM THE EXXON VALDEZ # SUBTIDAL STUDY NO 4
ST004	INTERIM RPT	OS02	1991	30065953	30065985	911122	WOLFE, DOUGLAS A;NOAA	DRAFT PRELIMINARY STATUS RPT - FATE & TOXICITY OF SPILLED OIL FROM THE EXXON VALDEZ # SUBTIDAL STUDY NO 4
ST005	INTERIM RPT	OS02	1991	30065987	30066051	911120	TROWBRIDGE, CHARLIE; BRANNIAN, LINDA; DONALDSON, WAYNE;URBAN, DAN;VINING, IVAN;KINZER, VERA;COYER, DAN;ADFGDCF	STATE / FED NRDA DRAFT PRELIMINARY STATUS RPT - INJURY TO PWS SPOT SHRIMP # SUBTIDAL STUDY NO 5
ST005	FINAL RPT	OS09	1991	30418081	30418234	921200	TROWBRIDGE, CHARLIE; VINING, IVAN;ACKLEY, DAVE;BRANNIAN, LINDA; DONALDSON, WAYNE;ADFGDCF	INJURY TO PWS SPOT SHRIMP - STATE / FED NRDA FINAL RPT # SUBTIDAL STUDY NO 5
ST006	INTERIM RPT	OS02	1991	30066053	30066100	911120	HOFFMANN, ANDREW;HEPLER, KELLY;HANSEN, PATRICIA; ADFGDSF	STATE / FED RESOURCE DAMAGE ASSESSMENT DATA SUMMARY RPT - INJURY TO DEMERSAL ROCKFISH & SHALLOW REEF HABITATS IN PWS # SUBTIDAL STUDY NO 6 (FISH / SHELLFISH STUDY NO 17)
ST007	INTERIM RPT	OS02	1991	30066102	30066200	000000	VARANASI, USHA;CHAN, SIN-LAM;COLLIER, TRACY K; JOHNSON, LYNDAL L;KRAHN, MARGARET M;KRONE, CHERYL A;SANBORN, HERBERT R; STEHR, CARLA;NOAA	GROUNDFISH TRAWL ASSESSMENT INSIDE & OUTSIDE PWS - ASSESSMENT OF OIL SPILL IMPACTS ON FISHERY RESOURCES - MEASUREMENT OF HYDROCARBONS & THEIR

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								METABOLITES, & THEIR EFFECTS, IN IMPORTANT SPECIES # SUBTIDAL STUDY NO 7
ST008	DETAIL PLAN	OS01	1992	30016427	30016436	920301	SHORT, JEFFREY	MUSSEL TISSUE & SEDIMENT HYDROCARBON DATA SYNTHESIS # MAR 01 1992 - FEB 28 1993
TM001	DETAIL PLAN	OS01	1989	5958625	5958637	891019	CALKINS, DONALD W;ADFG	STATE - FED NRDA DETAILED STUDY PLAN, APR 1989 - FEB 1990 # PROJECT TITLE ASSESSMENT OF THE EVOS ON THE SITKA BLACK-TAILED DEER IN PWS & THE KODIAK ARCHIPELAGO - TERRESTRIAL MAMMAL STUDY 1 - SIGNED
TM001	INTERIM RPT	OS01	1989	30032948	30032958	900115	CALKINS, DONALD G; SPRAKER, TERRY;VANDAELE, LARRY;ADFG	ASSESSMENT OF THE EVOS ON THE SITKA BLACK-TAILED DEER IN PWS & THE KODIAK ARCHIPELAGO - TERRESTRIAL MAMMAL STUDY NO 1 # PRELIMINARY STATUS RPT FOR APR - DCM 1989
TM001	DETAIL PLAN	OS05	1990	5965664	5965678	900312	ADFG; CALKINS, DONALD G; OSIAR DIR; OSIAR PROJECT MANAGER; SUPERVISOR	STATE / FED NRDA DETAILED STUDY PLAN MAR 1990 - FEB 1991 ASSESSMENT OF THE EVOS ON THE SITKA BLACK-TAILED DEER IN PWS & THE KODIAK ARCHIPELAGO
TM001	INTERIM RPT	OS02	1990	30092438	30092446	901128	CALKINS, DONALD G;LEWIS, JONATHAN P;ADFG	ASSESSMENT OF THE EVOS ON THE SITKA BLACK-TAILED DEER IN PWS & THE KODIAK ARCHIPELAGO # TERRESTRIAL MAMMAL STUDY NO 1
TM001	FINAL RPT	OS01	1991	30016017	30016040	910228	ADFG;LEWIS, JONATHAN; CALKINS, DONALD G	FINAL RPT ASSESSMENT OF EVOS ON SITKA BLACKTAIL DEER IN PWS & KODAIK ARCHIPELAGO
TM002	DETAIL PLAN	OS01	1989	5958651	5958654	890400	CALKINS, DON;ADFG	STATE - FED NRDA DETAILED STUDY PLAN, APR 1989 - FEB

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								1990 # ASSESSMENT OF EVOS ON BLACK BEAR IN PWS - STUDY ID TERRESTRIAL MAMMAL STUDY NO 2 - UNSIGNED
TM002	INTERIM RPT	OS02	1989	30092447	30092453	000000	ADFG	REVIEW OF LITERATURE ON INTERTIDAL HABITAT USE BY BLACK BEAR # TERRESTRIAL MAMMAL STUDY NO 2
TM002	FINAL RPT	OS10	1989	10979702	10979715	910228	MCCRACKEN, BETSY;ADFG	REVIEW OF LITERATURE ON INTERTIDAL HABITAT USE BY BLACK BEAR # TERRESTRIAL MAMMAL STUDY NO 2 - FINAL RPT
TM003	DETAIL PLAN	OS01	1989	373640	373657	891027	CALKINS, DONALD;ADFG; FARO, JAMES B	STATE / FED NRDA DETAILED STUDY PLAN APR 1989 - FEB 1990 - ASSESSMENT OF THE EFFECT OF EVOS ON RIVER OTTERS & MINK IN PWS # NRDA TERRESTRIAL MAMMAL STUDY NO 3
TM003	DETAIL PLAN	OS01	1990	594089	594105	900300	ADFG; FARO, JAMES B	STATE / FED NRDA DETAILED STUDY PLAN - MAR 1990 - FEB 1991 ASSESSMENT OF THE EVOS ON RIVER OTTERS & MINK IN PWS # UNSIGNED
TM003	INTERIM RPT	OS02	1990	30136371	30136419	000000	FARO, JAMES B;BOWYER, R TERRY;TESTA, J WARD;ADFG; UAF	ASSESSMENT OF THE EFFECTS OF THE EVOS ON RIVER OTTERS IN PWS # TERRESTRIAL MAMMAL STUDY NO 3
TM003	INTERIM RPT	OS01	1989	30032928	30032938	900115	FARO, JAMES B;BOWYER, TERRY R;TESTA, J WARD; BECKER, EARL;ADFG;UAF	ASSESS EFFECTS OF THE EVOS ON RIVER OTTER & MINK IN PWS - TERRESTRIAL MAMMALS STUDY NO 3
TM003	INTERIM RPT	OS02	1990	30092454	30092466	901128	FARO, JAMES B;ADFG; BOWYER, R TERRY;TESTA, J WARD;UAF	ASSESSMENT OF THE EFFECTS OF THE EVOS ON RIVER OTTERS IN PWS # TERRESTRIAL MAMMAL STUDY NO 3
TM003	DETAIL PLAN	OS01	1991	9291267	9291289	910300	ADFG;FARO, JAMES B;	STATE / FED NRDA DETAILED

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
							BOWYER, R TERRY;TESTA, J WARD	STUDY PLAN MAR 1991 - FEB 1992 - ASSESSMENT OF THE EFFECT OF THE EVOS ON RIVER OTTERS IN PWS # TERRESTRIAL MAMMAL STUDY NO 3
TM003	DETAIL PLAN	OS01	1992	30016437	30016442	920301	ADFG;FARO, JAMES	ASSESS EFFECTS OF EVOS ON RIVER OTTER IN PWS # MAR 01 1992 - FEB 28 1993
TM003	INTERIM RPT	OS01	1991	30016041	30016089	920400	FARO, JAMES	ASSESSMENT OF EFFECTS OF EVOS ON RIVER OTTERS IN PWS
TM004	DETAIL PLAN	OS01	1989	8077703	8077721	891027	ADFG; CALKINS, DONALD; DOI; NPS; USFWS	STATE FED NRDA DETAILED STUDY PLAN APR 1989 - FEB 1990 PROJECT TITLE: ASSESSMENT OF EVOS ON BROWN BEAR POPULATIONS ON THE AK PENINSULA # TERRESTRIAL MAMMAL STUDY NO 4
TM004	DETAIL PLAN	OS01	1990	886586	886607	900312	CALKINS, DONALD G;ADFG	STATE / FED NRDA DETAILED STUDY PLAN - ASSESSMENT OF THE EVOS ON BROWN BEAR POPULATIONS ON THE AK PENINSULA # TERRESTRIAL MAMMAL STUDY NO 4 - UNSIGNED
TM004	INTERIM RPT	OS01	1989	30032939	30032947	900115	CALKINS, DONALD G; SELLERS, RICHARD;JOHNSON, DAVID;VANDAELE, LARRY	ASSESSMENT OF THE EVOS ON BROWN BEAR POPULATIONS ON THE AK PENINSULA - TERRESTRIAL MAMMAL STUDY NO 4 # INTERIM STATUS RPT FOR APR - DCM 1989
TM004	INTERIM RPT	OS02	1990	30092467	30092502	901128	CALKINS, DONALD G;LEWIS, JONATHAN P;ADFG	ASSESSMENT OF THE EVOS ON BROWN BEAR POPULATIONS ON THE AK PENINSULA # TERRESTRIAL MAMMAL STUDY NO 4
TM004	DETAIL PLAN	OS01	1991	7981128	7981131	910300	ADFG;CALKINS, DONALD G; LEWIS, JONATHAN P	STATE / FED NRDA DETAILED STUDY PLAN MAR 1991 - FEB 1992 - ASSESSMENT OF THE EVOS ON BROWN BEAR POPULATIONS ON THE AK

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								PENINSULA # TERRESTRIAL MAMMAL STUDY NO 4
TM004	FINAL RPT	OS01	1991	30016090	30016137	911128	ADFG;LEWIS, JONATHAN; SELLERS, RICHARD	ASSESSMENT OF EVOS ON BROWN BEARS ON AK PENINUSLA - FINAL RPT
TM005	DETAIL PLAN	OS01	1989	120087	120090	890400	ADFG;CALKINS, DON	STATE - FED NRDA DETAILED STUDY PLAN, APR 1989 - FEB 1990, EFFECTS OF OIL ON CARNIVORES & SMALL MAMMALS OUTSIDE PWS NO # TERRESTRIAL MAMAL STUDY NO 5 - UNSIGNED
TM006	DETAIL PLAN	OS01		630105	630109	000000	ADFG	INFLUENCE OF OIL HYDROCARBONS ON REPRODUCTION OF MINK (MUSTELA VISION) # TERRESTRIAL MAMMAL STUDY NO 6
TM006	DETAIL PLAN	OS05	1989	5563257	5563315	900215	WHITE, ROBERT G; INSTITUTE OF ARCTIC BIOLOGY;SOUSA, MARSHA; WILLIAMSON, FRANCIS S; BLAKE, JOHN E;ROWELL, JANICE E;JAMES, JEAN	STATE / FED NRDA & RESTORATION STRATEGY PLAN - INFLUENCE OF OIL HYDROCARBONS ON REPRODUCTION OF MINK (MUSTELA VISON) # TERRESTRIAL MAMMALS STUDY NO 6 - INCLUDES MEMO FROM JIM LYNCH TO UAF VICE CHANCELLOR RE OVERHEAD RATES DATED JUN 07 1988 - CURRICULUM VITAE OF ROBERT G WHITE - DRAFT
TM006	DETAIL PLAN	OS01	1990	886608	886641	900216	WHITE, ROBERT G;BLAKE, JOHN E;SOUSA, MARSHA; ROWELL, JANICE;ADFG	INFLUENCE OF OIL HYDROCARBONS ON REPRODUCTION OF MINK - MUSTELA VISON # TERRESTRIAL MAMMAL STUDY NUMBER 6
TS001	DETAIL PLAN	OS03	1989	30449212	30449249	000000	MANEN, CAROL-ANN; ROBINSON-WILSON, EVERETT; NOAA;USFWS	HYDROCARBON ANALYTICAL SUPPORT SERVICES & ANALYSIS OF DISTRIBUTION & WEATHERING OF SPILLED OIL #

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								TECHNICAL SERVICE STUDY NO 1
TS001	INTERIM RPT	OS03	1989	30449250	30449254	000000	MANEN, CAROL-ANN;NOAA	HYDROCARBON ANALYTICAL SUPPORT SERVICES & ANALYSIS OF DISTRIBUTION & WEATHERING OF SPILLED OIL # TECHNICAL SERVICES STUDY NO 1
TS001	DETAIL PLAN	OS03	1990	30448996	30449027	000000	MANEN, CAROL-ANN;NOAA	HYDROCARBON ANALYTICAL SUPPORT SERVICES & ANALYSIS OF DISTRIBUTION & WEATHERING OF SPILLED OIL # TECHNICAL SERVICES STUDY NO 1
TS001	DETAIL PLAN	OS01	1990	526144	526148	900301	MANEN, CAROL A; NOAA; ROBINSON-WILSON, EVERETT; USFWS	HYDROCARBON ANALYTICAL SUPPORT SERVICES & ANALYSIS OF DISTRIBUTION & WEATHERING OF SPILLED OIL # DATE OF PLAN MAR 1 1990 - FEB 28 1991
TS001	INTERIM RPT	OS03	1990	30449028	30449033	000000	MANEN, CAROL-ANN;NOAA	HYDROCARBON ANALYTICAL SUPPORT SERVICES & ANALYSIS OF DISTRIBUTION & WEATHERING OF SPILLED OIL # TECHNICAL SERVICES STUDY NO 1 - STATUS RPT
TS001	DETAIL PLAN	OS03	1991	30448992	30448995	910129	MANEN, CAROL-ANN;NOAA	HYDROCARBON ANALYTICAL SUPPORT SERVICES & ANALYSIS OF DISTRIBUTION & WEATHERING OF SPILLED OIL # TECHNICAL SERVICES STUDY NO 1
TS001	INTERIM RPT	OS01	1991	30015840	30015849	920000	MANEN, CAROL-ANN	EXECUTIVE SUMMARY HYDROCARBON ANALYTICAL SUPPORT SERVICES & ANALYSIS OF DISTRIBUTION & WEATHERING OF SPILLED OIL
TS001	DETAIL PLAN	OS01	1992	30016370	30016372	920301	MANEN, CAROL-ANN	HYDROCARBON ANALYTICAL SUPPORT SERVICE & ANALYSIS OF DISTRIBUTION &

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								WEATHERING OF SPILLED OIL # MAR 01 1992 - FEB 28 1993
TS002	DETAIL PLAN	OS01	1989	373996	374002	890400	MEYERS, THEODORE R;ADFG; USFWS;NOAA	STATE / FED NRDA ASSESSMENT DETAILED STUDY, HISTOPATHOLOGY - EXAMINATION OF ABNORMALITIES IN TISSUES FROM BIRDS, MAMMALS, FINFISH, & SHELLFISH EXPOSED TO THE SPILLED OIL
TS002	FINAL RPT	OS09	1991	10982851	10983256	930521	HINTON, DAVID E;MARTY, GARY D;OKIHIRO, MARK S; UNI OF CA	FISH HISTOPATHOLOGY RPT ON EVOS # FINAL SUMMARY SCIENTIFIC RPT
TS003	DETAIL PLAN	OS01	1989	7988989	7989027	890925	DIRECTOR; DNR; LYLES, DIANNE M; MANAGEMENT OFFICIAL; MCMAHON, RICHARD; OSIAR; PROGRAM MANAGER; SLOTHOWER, ROGER; USFWS	NRDA & RESTORATION STRATEGY FOR THE EVOS DETAILED STUDY PLAN SEP 25 1989 TECHNICAL SERVICES STUDY NO 3 TITLE: MAPPING OF DAMAGE ASSESSMENT DATA & INFO
TS003	DETAIL PLAN	OS01	1990	7083031	7083047	900515	LYLES, DIANNE M;DNR; MCMAHON, RICHARD	NRDA TECHNICAL SERVICES STUDY NO 3 , MAPPING OF DAMAGE ASSESSMENT DATA & INFO (GIS) , UPDATED STUDY PLAN - UPDATE TO THE NRDA DETAILED STUDY PLAN DATED SEP 25 1989
TS003	DETAIL PLAN	OS01	1990	7932652	7932677	901115	DNR; EVOS DAMAGE ASSESSMENT GEOPROCESSING GROUP; GIS TECHNICAL GROUP; LRIS; LYLES, DIANNE M; MCMAHON, RICHARD; NRDA	EVOS NRDA DETAILED STUDY PLAN TECHNICAL SERVICES STUDY NO 3 GIS TECNICAL GROUP MAPPING OF DAMAGE ASSESSMENT DATA UPDATE TO THE NRDA DETAILED STUDY PLAN NOV 15 1990
TS003	DETAIL PLAN	OS01	1991	8164754	8164773	910606	LYLES, DIANNE M;DNR; MCMAHON, RICHARD;BOYLE, BARBARA;USFWS	EVOS NRDA DETAILED STUDY PLAN, TECHNICAL SERVICES STUDY NO 3 GIS TECHNICAL GROUP MAPPING OF DAMAGE ASSESSMENT DATA UPDATE TO THE NRDA DETAILED STUDY PLAN # ATTACHING LETTER OF

NRDA DOCUMENT INDEX LIST - STATE OF ALASKA
OSPIC PUBLIC RELEASE

STUDY	NRDATYPE	PROD	NRDAYR	ACCNO	ENDPG	DATE	AUTHOR	TITLE
								JUN 3 1991
TS003	INTERIM RPT	OS01	1991	30445536	30445615	911120	GIS TECHNICAL GROUP	NRDA RPT # MAPPING OF DAMAGE ASSESSMENT DATA